THE GAS JOURNAL

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A Glance at the Contents—

A Portable Calorimeter.

Reference is made to a new portable calorimeter made by the Junkers Company. [p. 507.]

Association of Public Lighting Engineers.

This week the Association is in conference at Blackpool; and an account of the papers read commences on p. 509.

General Manager Required.

Applications are invited for the post of General Manager of a Gas Company, the salary offered being £1000 per annum. [p. 528.]

Distribution Superintendent Required.

A commencing salary of £300 per annum is offered for the post of distribution superintendent by a Company operating on the South-East Coast. [p. 528.]

Gas Oils for Carburetting.

Mr. A. Holmes, of the Standard Oil Company of New Jersey, describes a new method for the evaluation of the carburetting values of gas oils. [p. 505.]

Good Lighting and Safety.

Mr. I. H. Massey, Superintendent of Lighting, Oldham, has taken a census of accidents which have occurred in Oldham during the past three years, and has correlated the results with the lighting. [p. 513.]

Elswick Gas-Works.

An illustrated description of the carbonizing plant (Glover-West continuous vertical retorts) at the Elswick Gas-Works of the Newcastle-upon-Tyne and Gateshead Gas Company will be found on p. 504.

The Brockwell Seam in Durham.

The Brockwell seam throughout Durham produces one of the most valuable coking coals, being suited in every way to this use. On account of its fragility and relatively low volatile matter content it tends to be less used as a domestic fuel or as a gas coal, except in the south, where two of the samples are of somewhat harder coal, and one shows a considerably higher percentage of volatile matter. —From Fuel Research. Physical and Chemical Survey of the National Coal Resources No. 24. "The Northumberland and Durham Coalfield." [p. 508.]

Benzole Purification.

A new method for the purification of benzole by electrolytic oxidation is described on p. 507.

Benefits of Naphthalene Removal.

In his Presidential Address to the Association of Public Lighting Engineers, Mr. Harold Davies, of Chesterfield, mentions that in connection with service to public lamps, the time spent on this has been reduced to 8·8 p.ct. of the total time worked, owing to the installation of naphthalene extraction plant at the gas-works, and will be still further reduced. [p. 509.]

Association of Statutory Inspectors of Gas Meters.

A report is published of the annual general meeting of the Association, which was held in Edinburgh on Friday last. A paper entitled "Administering the Sale of Gas Acts in Edinburgh" was read by Mr. W. Gordon, the Chief Inspector for Edinburgh. Among the questions discussed was the re-verification of meters after a stipulated period of use on the district. [p. 519.]

Public Clock Lighting.

In a paper before the Association of Public Lighting Engineers, Mr. J. H. Clegg, of Burnley, explains that all the large public clocks in Burnley are lighted by gas. There are four, and they are responsible for a total gas consumption of over 1¼ million c.ft. per annum. Gas has been found to be very suitable for this type of lighting, resulting in a mellow even illumination of each dial, and the warmth given off from the burning gas is sufficient to maintain the clock room in a suitable condition, preserve the mechanism of the clock, and keep the lubricating oil from stiffening in winter. [p. 515.]

Public Lighting in Sheffield.

Since the inauguration of a Public Lighting Department in Sheffield in 1924, the candle-power per head of the population has been increased from 0·95 to 4·60, while the cost per head has only been increased from 22·94d. per annum to 29·31d. per annum—an increase of 348 p.ct. in candle-power and 28 p.ct. in cost. During that period, the entire lighting plant of the city has been overhauled.—From an address on the "Administration of Public Lighting" by Mr. R. H. Minshall, Chairman of the Sub-Committee of Street Lighting, City of Sheffield, before the Association of Public Lighting Engineers. [p. 511.]

Forthcoming Engagements

Sept. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 10 a.m.; Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Gas Education Executive Committee, 4 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 13.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board. There will be no meeting of the Board or of the Central Committee of the Federation of Gas Employers during August.

Sept. 13.—B.C.G.A.—Meeting of the General Committee at 4 o'clock approximately, 28, Grosvenor Gardens, S.W. 1.

Sept. 14.—INSTITUTION OF GAS ENGINEERS.—Meetings of Purifiers Sub-Committee, 10.15 a.m.; Gasholders Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 15.—S.B.G.I.—Meeting of Council in the afternoon.

Sept. 19.—INSTITUTION OF GAS ENGINEERS.—Meetings of Calorimeters Sub-Committee, 2.30 p.m.; Sir Arthur Duckham Memorial Fund Exploratory Committee, 4.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 20.—INSTITUTION OF GAS ENGINEERS.—Meetings of Joint Research Committee, 10 a.m.; Liquor Effluents and Ammonia Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 21.—INSTITUTION OF GAS ENGINEERS.—Meetings of Meters Committee, 10.15 a.m.; Tar Sub-Committee, 12 noon; Committee on the Admittance of Chemists to Corporate Membership, 2.30 p.m., 28, Grosvenor Gardens, S.W.1.

Sept. 22.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Meeting at Porthcawl.

Sept. 26 to 28.—B.C.G.A.—Annual Conference at Leeds.

EDITORIAL NOTES

The Turning Point?

WHILE we are all on the look-out for real evidence of that improvement in industrial affairs of which the country is so desperately in need, it is of particular interest to note that for the past month a big continued advance is recorded in wholesale prices—a general gain of 3·4 p.ct. over July being registered. Pointing to this, the Statistical Correspondent of the "Financial Times" says that, while the advance was general it was most noticeable in the case of industrial materials, which rose on the average by 4·8 p.ct. These, too, are 1 p.ct. above their level of a year ago, and 3·2 p.ct. above their level of last September. The "Financial Times" index-figures show that this upward movement has continued week by week right up to the end of the month.

Commenting on the position thus revealed, the writer remarks that the chief question to-day is whether this improvement is likely to continue. "For the moment the pace seems to have been too hot, and a slowing-down, or even a temporary recession, would cause no surprise. Apart from this, there is some justification for hoping for a continuance of the rise. . . . Thus for the first time for several years it is possible to view the world outlook with hope."

Public Lighting

COMMENTING in last week's "JOURNAL" on the Board of Trade Return of the authorized undertakings in Great Britain, among other things we said: "We are told by a writer in a contemporary devoted to the interests of electricity that 'hardly a week passes without a change over of street lamps somewhere from gas to electricity.' This must be a quite recent development, because according to this official Return, the quantity of gas sold for public lamps in 1931 increased from 11,288 million c.ft. to 11,787 millions. Facts are stubborn things." And there are facts in plenty in the papers presented at the Ninth Annual Meeting of the Association of Public Lighting Engineers, which is being held in Blackpool this week, which afford direct proof that gas is by no means waning in popularity as an illuminant of our streets.

Improvements in lighting technique generally, from the points of view of both installation and maintenance, and in particular improvements in gas lighting equipment, have taken place with great rapidity during the last few years, and the development of better gas lighting fittings is by no means at an end. And in regard to both lighting technique and the status of the public lighting engineer, the Association of Public Lighting Engineers has unquestionably done yeoman service. It has had a uniting effect, and has served excellently as an educative medium. As to its future development of what may be termed internal education, the remarks of the President, Mr. Harold Davies, of Chesterfield, are significant. "I think the time will shortly come," he observes, "if it has not already arrived, for this Association to consider what steps can be taken to prepare an education scheme for the sound guidance of aspiring public lighting engineers, the summit of which might well be the Diploma of our Association, with entrance into the ranks of full membership." Moreover, the Association has brought to the notice of municipalities that expenditure on improved lighting is not an extravagance, but a necessity if we are to meet modern conditions of dense, fast-moving traffic.

The inauguration of the Association was a wise move which has thoroughly justified itself, and the Association to-day is stronger than ever and more securely organized to give still greater services to those in its ranks and to the public as a whole. It has been generally responsible for the setting-up of lighting departments in various cities and towns where none existed before; and wherever such action has been taken by the municipalities concerned, the results have been uniformly successful. We have, for example, the testimony of the Chairman of the Sheffield Sub-Committee of Street Lighting, Mr. R. H. Minshall, who gives an account of the success which has attended the institution of a Street Lighting Department in that city. A few of his figures are well worth repeating. Since the appointment of a Public Lighting Engineer the cost of candle-power has been reduced from 2s. to 6½d., and the lighting hours have been increased enormously. As for the candle-power per head of the population, this has been raised by 348 p.ct., while the increase in cost has only been 28 p.ct. Since the Department started to function in 1924 the entire lighting plant of the city has been overhauled and automatic lighting and extinguishing equipment installed. The whole expenditure has been met out of revenue, and we thoroughly agree that the amount paid in the general rate for this service is one of the finest investments which the ratepayer can make for the safety of life and limb and the enhanced prestige of the municipality in which he dwells.

Illumination and Safety

STATISTICS linking up illumination and safety are by no means numerous; and the figures given by Mr. I. H. Massey, Lighting Superintendent at Oldham, are most welcome. He has taken a census of accidents which have occurred in Oldham during the past three years and has correlated the results with the public lighting. He makes the quite legitimate assumption that the number of accidents is proportionate to the traffic risks, and on this assumption he demonstrates by facts that good lighting greatly reduces the accident risk. Mr. Massey outlines what has been done in Oldham since the Town Council created, eight years ago, a separate Department to carry out the work of lighting the streets of the Borough. In this period the candle-power has been increased by 43 p.ct.; the expenditure reduced by 17 p.ct. A good record. From figures which have been published in the United States of America it is estimated that the saving by really good lighting throughout the country would pay for nearly double the expenditure needed; and no doubt an equally good case could be made out for public lighting in Great Britain.

One of the chief advantages of a public lighting department is that the installation can be maintained in a highly efficient manner and improvements made as they are brought out. A lump sum for installation costs, raised perhaps by a loan, is only the beginning of lighting service, and there is no doubt at all that Mr. Minshall is quite right in maintaining that part of the rates should be apportioned to the operation of a Public Lighting Department adequately staffed and equipped for technical testing, and that the Public Lighting Engineer should be regarded as among the chief officials of the town or city. The same idea is expressed by Mr. Davies: "I am convinced that some of our cities, and many of our larger towns, would achieve much better results in public lighting, without additional cost, by having at the head of this service a full-time technical officer with a high standard of training and ability for his job."

Facts Speak for Themselves

WE have spoken about facts concerning the development of gas lighting, and a typical instance is afforded in Mr. J. H. Clegg's outline of the work which has been done in Burnley since the appointment of a Street Lighting Sub-Committee seven years ago, prior to which time the street lighting of the town was controlled by the Gas Committee. Even in 1925 Burnley was well lighted, though it would not bear favourable comparison with the present state of affairs. Both electricity and gas are sup-

plied by the Corporation, and when new schemes of lighting came up for consideration, both the Electricity Department and the Gas Department were given a fair test to show what they could do for a given sum of money. Test stretches were given to both Departments, and after careful and unbiased consideration 4½ miles of one scheme of improvement was carried out by the Gas Department, and 2½ miles by the Electricity Department; and though photometric results between the two systems of lighting were agreed to be practically equal, the general expression of the public is that the gas lighting is the more effective. In common with other towns, arterial roads have been constructed during the past few years, and competitive tenders were also obtained for the lighting of these by the two Departments. The fact that the total length of 5½ miles is lighted by gas does not indicate that "hardly a week passes without the change over of street lamps somewhere from gas to electricity." Then the Burnley housing scheme lighting, and the development of new estates, led also to competitive tenders being obtained. Except for one installation, they are all lighted by gas. At the present time there are in Burnley 3992 gas lamps to 187 electric lamps.

A highly interesting example of the value of gas lighting on account of its combined qualities of light and heat is given by Mr. Clegg, who describes the application of gas to the lighting of public clocks. Actually in Burnley all the large public clocks are illuminated by gas, and the total load is over 1¼ million c.ft. a year. Gas, says Mr. Clegg, has been found to be very suitable for this type of lighting, resulting in a mellow even illumination of each dial, and the warmth given off from the burning gas is sufficient to maintain the clock room in a suitable condition, preserving the mechanism of the clock, and keeping the lubricating oil from stiffening in the winter.

In regard to the British Standards Institution's Street Lighting Specification, which at the present time is under consideration for revision for the second time, we agree with Mr. Davies that it would be desirable to start with a classification which can and must be regularly maintained. As he says, the purchaser of light for street illumination needs to be assured that he is getting that light regularly. The contractor who supplies the equipment requires the conditions under which his installation is to function assured of a certain standard of power and maintenance. The President would like to see gas lamps and burners of every design submitted to some central testing authority, where all the conditions of public lighting would be known, and where the lamps, &c., would be called upon to withstand such conditions before the pattern could be certified as efficient and suitable for the purpose for which it is designed. Gas mantles also for public lighting should have some hall-mark of efficiency. No doubt some of the larger authorities do not feel the need for this, but it would help those smaller, but more numerous, authorities who are called upon to carry out public lighting without being in a position to undertake accurate scientific tests.

A *Question of Debate*

THE problem of how best to deal with papers and discussions at technical meetings is one that is always present, and any suggestions should be certain of careful consideration. Only a week or two ago there appeared in the daily Press an account of such a suggestion, which took the form of the use of an egg-timer to regulate the time that should be allocated to each speaker at a meeting, and now another, and even more drastic, innovation has made its appearance.

This time it is to the British Association for the Advancement of Science that thanks are due for the publicity which has been given to the proposal. This in its original form is not intended to refer to technical associations, but to that august body the House of Commons. Prof. Miles Walker, in his Presidential Address to the Section of Engineering, suggested that all Bills should be circulated some weeks before being read, and that members who have anything to say upon them should be asked to dictate their remarks to a typist or otherwise prepare them. These remarks would then be sent to a staff of under-secretaries, to make a synopsis of the whole. Any member misrepresented by this synopsis could have an opportunity of amending it. The procedure in the House would be as follows: When a Bill came up for consideration, an official would read Clause I., and say: "Twenty members have said so-and-so, eleven say so-and-so. As against this, fifteen express this view, nine express the opposite view, and give the following reasons," &c.

Though our legislators were in the President's mind, there is just a glimmer of an idea here for our technical associations. What about a synopsis of a discussion somewhat on the same lines: "So many members congratulated the author upon his paper; so many members said this; so many members said that; and so many members said the other?" On first acquaintance, the prospect dazzles; but, on second thoughts, as we ourselves would have to prepare the synopsis, we are inclined to plump for leaving matters as they are.

Rating of Public Utility Undertakings

REFERENCE was made in these columns of our issues of May 20 and Sept. 23, 1931 (pp. 471, 719), to the recommendations of the Special Sub-Committee of the Central Valuation Committee which were included in the Seventh Series of Representations to the Minister of Health and outlined the procedure it was suggested should be adopted by Rating Authorities in the valuation of gas, water, and electricity undertakings extending into more than one Rating Area. While not all the anomalies which have arisen in the assessment of public utilities to local rates would be removed by the adoption of these recommendations, it was felt that a considerable advance had been made in securing official recognition of the difficulties to be contended with and an appreciation of ways in which Rating Authorities might assist in promoting a greater measure of uniformity in rating practice. It is with interest, therefore, that we note that the Secretary to the Central Valuation Committee has addressed to every Rating Authority a communication which primarily directs attention to the Rating and Valuation (No. 2) Act, 1932—which recently received the Royal Assent, and amends section 40 (1) of the principal Act of 1925 by substituting the permissive form "may" for the obligatory term "must" in connection with the returns required to be made for rating purposes under the Act—but also makes reference in two respects to Resolution No. 68 of the Seventh Series of Representations.

In the first place, the Committee refer to paragraph X. of that resolution (in which the *cumulo* Net Annual Value of extensive public utility undertakings and the apportionment thereof should be ascertained, it was suggested, by valuers appointed to act on behalf of all the various local authorities concerned), and while they express reason to believe that effect is being given to this recommendation, urge that, where no action has yet been taken for the joint appointment of Valuers, the initial step should be the convening, without delay, "of a conference of representatives of all the local authorities concerned in the valuation of the undertaking, and that, in the absence of special circumstances, this first step might appropriately be taken by the Rating Authority within whose area the head offices of the undertaking are situated."

This very definite recommendation on the part of the Central Valuation Committee is to be welcomed, in view of the active preparations now being made for the purposes of the Second Valuation Lists. In this connection, also, it is highly satisfactory to note that the Committee point out that if their suggestion in paragraph VIII. of Resolution No. 68 (regarding the information to be obtained under section 40 of the Act of 1925 from company and municipal undertakings by the *cumulo* valuers) be adopted, it will not be necessary, having regard to the discretion now given to Rating Authorities by the 1932 Act (above referred to), that a separate notice requiring

returns from undertakings in their respective areas should be issued by each Rating Authority affected.

It is confidently believed that the relaxation of the statutory directions affecting the issue of rating returns and the recommendations of the Committee regarding the collection and collation of the data required for the assessment of gas and other public utility undertakings will do much not only to promote greater uniformity in rating, but to reduce the trouble and expense entailed on both the Rating Authority and the public utility in connection with the valuation of such undertakings. The Central Valuation Committee, having been once convinced of the inequalities existing in this branch of rating practice, are to be congratulated on keeping their recommendations before the notice of the Rating Authorities throughout the country; and gas undertakings will be well advised to do whatever possible to ensure that the local authorities under whose jurisdiction for rating they come adopt these recommendations of the Committee prior to the coming in force of the Second Valuation Lists.

PERSONAL

NEWPORT SILVER MEDALLIST.

In the recent examination of the City and Guilds of London Institute, JAMES J. ASQUITH, an employee of Newport (Mon.) Gas Company, passed with such distinction in the final examination in gasfitting that he was awarded the Institute's silver medal.

This is the second time within four years that this medal has been won by an employee of Newport (Mon.) Gas Company, it having been secured in 1928 by Mr. W. Biggins.

Both of these silver medallists have been students of the gasfitting classes held at the Newport Technical Institute, and taught by Mr. W. W. Beech, Chief Fitting Inspector of the Company. As this examination is open to the whole of the United Kingdom, and there are hundreds of entries annually, it is creditable to all concerned that this distinction has been secured twice within such a short period by Newport.

* * *

An arrangement has been come to between Mr. R. G. SHADBOLT, Past-President of the Institution of Gas Engineers, and Messrs. John & Joseph Taunton, Ltd., Gas Meter Manufacturers, of Birmingham, for the Chief Representation of the Company, and the sale of their products over the whole of the British Isles, with certain exceptions, commencing as from Sept. 1, 1932. This arrangement has been made with a view to facilitating the distribution of the Company's goods with the greatest possible advantage to their customers.

OBITUARY

The death took place at King's Lynn late on Friday night last of Mr. EDMUND GEORGE SMITHARD in his 71st year. Deceased was for over thirty years Manager and Secretary to the King's Lynn Gas Company, a position from which he retired 3½ years ago. He was actively associated with various phases of public work.

CORRESPONDENCE

Holding-Down Bolts for Disc-Type Gasholders

SIR,—Frankly, I cannot understand Mr. J. R. Dorsey's remarks in his letter published in your issue of Aug. 31, concerning my expression $\frac{3}{5}$.H for the position of resultant wind pressure upon high structures such as those under discussion here. The H therein is a variable, and in this respect differs not at all from the H in the old-time expression $\frac{H}{2}$. If Mr. Dorsey prefers the latter, he is entitled to do so, but personally I prefer to be on the safer side now that disc-type holders are reaching such considerable heights.

He also appears to favour the results of an article by Mr. S. M. Milbourne, published in the "JOURNAL" previously. I am sorry to read this, because not only in my opinion does that article fail in many respects, as I have tried to indicate already, but an argument based upon it is only applicable to spirally-guided holders.

In the present case, the subject is quite a straightforward one, involving a rigid structure the reactions for which have to be mechanically considered to operate together all round the holder, and for which the formula and reasoning I provide are based upon true mathematical summations.

Mr. Dorsey appears to have made the mistake that the weight per sq. ft. of holder surface resulting from my investigation was supposed by me to represent the actual weight per sq. ft. of a holder of the type named. On the contrary, the whole investigation was to show *what* amount of weight per sq. ft. would counterbalance all the tilting moment, even for the great pressures assumed.

I also, in the article, explained the assumptions made. As to Hutton's formula, I am not responsible for this, but like many structural engineers have to rely upon it until a better is found and proved. Merely saying it is doubted does not carry one far. Even the results of wind upon cylindrical bodies which gas engineers rely upon for their effective wind pressure data were, as far as I know, merely due to experiments on models; and I believe the Hutton results were similarly derived and graphed to get a law therefrom. Models are not wholly satisfactory, but what else is there?

Finally, I am rather at a loss to understand all these attempts to prove me wrong. I have no "axe to grind," but am merely trying to give what little aid I can towards the progress of the Industry concerned. This has been my object throughout the last forty years I have been writing to the Technical Press on all manner of subjects.

Yours, &c.,
A. GADD.

62, *Barton Arcade,*
Manchester,
Sept. 1, 1932.

[This correspondence must now be regarded as closed.—ED. "G.J."]

Fusion Point of Coal Ash.

Plea for International Standardization.

L. Bro in "Journal des Usines à Gaz," 1932, 56, 422-431 (Aug. 20), reviews the standard methods adopted in various countries and laboratories for the determination of the fusion point of coal ash, as regards heating conditions, the stage of deformation of the test piece attained in the test, and the terms employed for reporting the result of a test. The factors concerned in the test are discussed, and a plea is made for international standardization of the test conditions. It is suggested that contracts for the purchase of coal should include a clause covering the fusion point of the ash with a penalty in respect of each 45° Fahr. by which the ascertained fusion point is lower than the stipulated value, a tolerance of ±45° Fahr. being allowed for experimental error. Thus the penalty would not arise unless the fusion point were 90° Fahr. lower than the specified value.

THE NEWS OF THE WEEK

Sanction to Borrow £15,000 for mains extensions is sought by the Salford Corporation Gas Committee.

Burnley Gas Committee has decided to hold a gas exhibition in the Mechanics' Institution from Oct. 17 to 29.

A New "Gas Unit."—We learn from Mr. J. W. Brown, Engineer and General Manager to the Barbados Gas Company, Ltd., that he has adopted a "gas unit" equal to 10 c.ft.

Doncaster Gas Committee recommends the Corporation to seek power to borrow £15,000, the estimated capital requirement for mains renewals and extensions during the next three years.

The Salerni Process.—The "Financial Times" is informed that Lady Houston, recognizing the great national importance to coalfields of Sir Eric Hambro's work in developing the Salerni process, has agreed to find the necessary finance to prove the process commercially.

The Hastings and St. Leonards Gas Company are paying interim dividends (less income-tax) at the following rates: £7 p.ct. per annum on the 5 p.ct. converted stock; £5 10s. p.ct. per annum on the 3½ p.ct. converted stock; £6 8s. p.ct. per annum on the 5 p.ct. additional stock.

Evening Classes for Gasfitters again form a feature of the 1932-33 prospectus of the Technical Institute of Wandsworth, S.W. The students are divided into three grades, for whom, as from Sept. 26, there will be classes in the theory and practice of gas fitting on two evenings per week.

Vertical Chamber Ovens have been adopted by the Société Generale du Gaz in their new gas-works at Tours, to replace the old works which have been in existence since 1837, and which are incapable of further extension. The new works comprise seven benches of vertical chamber ovens.

The Maclaurin Plant at Dalmarnock is to be closed down for the manufacture of smokeless fuel. At a recent meeting of the Glasgow Corporation Gas Committee, the General Manager, Mr. J. W. M'Lusky, submitted a report showing the working results obtained from the plant from the date on which it was officially taken over by the Corporation from the contractors until the end of the financial year 1931-32. There are adverse balances in operating the process since 1925, amounting to £36,163. The Committee agreed to recommend that the plant be closed down for the manufacture of smokeless fuel.

"Re-levelling of London."

We are informed by the Secretary of the Institution of Gas Engineers that a volume entitled "Re-levelling of London, Abstracts of Secondary Lines," will be published by the Ordnance Survey on Sept. 9. The book should be of great value to surveyors, engineers, and others working in the London area, as it is possible that the revised levels, particulars of which it contains, will not appear on the published plans for a considerable time.

The book gives the revised values on the Newlyn datum, of some 2400 bench marks in an area extending from Hemel Hempstead and Ware on the North to Godstone on the South, and from Windsor on the West to Stroud and Chelmsford on the East. Each bench mark is described and the Ordnance Survey plan number is given, so that there should be no difficulty in the location of any mark. In addition to the latest revised heights based on Newlyn, the last published values on the Liverpool datum are given for purposes of comparison.

The price of the volume is 7s. 6d. paper covers, or 8s. 6d. cloth. Copies may be obtained from the Director-General, Ordnance Survey Office, Southampton, the principal booksellers, or the Secretary of the Institution of Gas Engineers, 28, Grosvenor Gardens, London, S.W. 1.

British Commercial Gas Association.

Annual Conference in Leeds.

The following programme has been arranged for the Twenty-first Annual General Meeting and Conference of the British Commercial Gas Association to be held in Leeds on Monday, Tuesday, and Wednesday, Sept. 26, 27, and 28, 1932, under the Presidency of Councillor Geoffrey H. Kitson, Chairman of the City of Leeds Gas Department.

Monday, Sept. 26.

EVENING.

Inaugural Meeting.

8. 0 to 8.30 p.m. Reception by the Lord Mayor of Leeds, Alderman Fred. B. Simpson, J.P., in the Victoria Hall, Town Hall, Leeds.
Mr. F. H. Robinson, Assoc.M.Inst.C.E., Engineer and Manager, Harrogate Gas Company, will give a Recital on the Great Organ during the Reception.

8.30 p.m. Address by Dr. G. C. F. Roe, L.R.C.P. & S. (Ireland), D.P.H., D.P.M., Medical Officer of Health, Halifax, entitled "The Air We Breathe."
A vote of thanks will be proposed by Dr. J. Johnstone Jervis, M.D., D.P.H., Medical Officer of Health, Leeds.

9. 0 to 10. 0 p.m. Music and refreshments.
Evening dress. Decorations will be worn.

Tuesday, Sept. 27.

MORNING.

Business Conference.

10. 0 a.m. Assembly of members in the Great Hall, Leeds University.

10.15 a.m. Address of welcome by the Lord Mayor of Leeds, Alderman Fred. B. Simpson, J.P.
Presentation of annual report and statement of accounts by the Executive Chairman, Sir Francis Goodenough, C.B.E.
Presidential Address by Councillor Geoffrey H. Kitson, Chairman, City of Leeds Gas Department.

12 noon. Display of commercial publicity films by Publicity Films, Ltd., in the Education Lecture Hall.

12.30 p.m. Adjournment.

AFTERNOON.

Business Conference on Industrial Gas.

3. 0 p.m. *Paper entitled "Industrial Gas—Achievement and Prospect," by Mr. A. W. Smith, General Manager and Secretary, City of Birmingham Gas Department.
Discussion.

4. 0 p.m. *Paper entitled "The Development of the Sale of Gas for Industrial Purposes," by Col. W. M. Carr, T.D., Engineer, General Manager and Clerk, Stretford and District Gas Board.
Discussion.

5. 0 p.m. Adjournment.

EVENING.

7.30 p.m. for 7.45 p.m. Dinner, which will be honoured by the presence of H.R H. Prince George, K.G., G.C.V.O., by invitation of the Chairman and Members of the City of Leeds Gas Committee, in the Victoria Hall, Town Hall, Leeds.
Evening dress. Decorations will be worn.

Wednesday, Sept. 28.

MORNING.

Business Conference.

10. 0 a.m. Visit to City of Leeds Gas Department Distribution Centre and Workshops, Bridge Street, Leeds.

11.40 a.m. Assembly in the Great Hall, Leeds University.

11.45 a.m. *Paper entitled "Some Views Regarding the Restricted Expansion of the Gas Industry and Counter Methods Adopted," by Mr. C. S. Shapley, M.I.Mech E., General Manager, City of Leeds Gas Department.
Discussion.

1. 0 p.m. Adjournment.

1.15 p.m. Luncheon in the Victoria Hall, Town Hall, Leeds, by invitation of the President-Elect, the Vice-Presidents, and Members of the Association to the retiring President and the Members of the City of Leeds Gas Committee.

Close of Conference.

* SPECIAL NOTE.—The authors of the papers will present summarized versions so as to allow as much time as possible for discussion.

THE NEWS—continued.

Lysaght Protected Steel.

An entirely new works at Newport (Mon.) has been built by the Lysaght Protected Steel Company, Ltd., for the manufacture of an all-British protected steel sheet which is certain to be of interest to our readers.

This protected steel is the result of seven years' research work by the Dunlop Rubber Company, who have patented the method of successfully protecting steel surfaces without an asphalt compound. This has been achieved in a secret process by applying vulcanized fibre to a steel surface, to which it becomes an adherent part. One of the primary advantages of this new material is that the edges of the sheets are equally protected, there being no folds or faulty edges which are subject to damage either in transit or erection. Lysaght protected steel has Messrs. John Lysaght, Ltd., and the Dunlop Rubber Company as godfathers.

The new material has high insulating properties, gives a sure footing for travel over the roof, and can be painted with ordinary oil paint, without priming. It may also be colour-washed, lime-washed, or a special sheet can be supplied suitable for plastering. It is unaffected by acids, alkalis, salt or fume laden air, or tropical heat.

New Locking Device for Preventing Thefts of Gas.

The firm of Messrs. Morse, Lockhart, and Morse, of Natick, Mass., says the "Gas Age-Record," have perfected a new locking device for gas meters and shut-off services. It was developed at the suggestion of the Boston Consolidated Gas Company, and is reported to have been used with success by this and other gas undertakings.

No larger than a rifle cartridge, the lock is easy to apply. It is inexpensive and is made in different sizes to fit various types of wing cocks. Where wing cocks are not in use, an effective cage for the shut-off cock is supplied. Some undertakings have preferred to use the collar which covers the meter nut.

Providing a positive locking, this device removes the danger of accidents resulting from unauthorized persons turning on the gas as well as preventing the stealing of gas. The steel barrel, head, and locking balls, cadmium plated, are so hard that it is practically impossible to saw or cut the lock, while the locking mechanism is difficult to pick.

Numerous attempts to cut or open the lock without a key have been made during the last year where it has been in use, but no success in removing this safeguard has been reported.

A Permanent Gas Exhibition in New Bond Street.

To-day there opens at 158, New Bond Street, W. 1, an attractive showroom called the Building Centre, which is supported by the Councils of the Royal Institute of British Architects and the Architectural Association, Heads of various official departments, leading architects, contractors, trade associations, and manufacturers.

The Centre, admission to which is free, will be open between the hours of 9.30 a.m. and 7 p.m., and consists of a permanent exhibition of examples of practically everything required to make and equip buildings of every type. It is the result of co-operation between architects supported by their official Institutions and manufacturers. It is claimed to provide the first example in England of an Exhibition where by close co-operation it has been possible to arrange exhibits in appropriate and specially designed settings—as for instance in some of the bathrooms where the general scheme has been designed by an architect, the baths and sanitary fittings supplied by one firm, the floor covering by another, the wall tiling, the paintwork, and the lighting fittings by others. In each case the manufacturer has produced some of the best examples of his work, which, by being placed in juxtaposition with objects in connection with which it is intended that they should be used, show to their best advantage, and make it more easy for the visitor to appreciate their quality and their appropriateness or otherwise, to meet his special requirements.

Practically everything to be seen at the Building Centre is an exhibit, the floor coverings, of which there is an almost endless variety in rubber, wood, linoleum, and other patent materials, the wall coverings, the ceilings, and, of course, the lighting fittings which actually illuminate the building, are all what might be termed working exhibits.

On the lower ground floor may be seen as specially displayed exhibits the heating plants of various types which will be actually used to heat the building. The air conditioning plant will be seen in operation in addition to a telephone exchange in use, exhibited by the General Post Office.

In addition to these working exhibits there are thousands of examples of manufactured materials and articles of equipment, wide ranges of bricks built up in wall formation, stones, marbles, samples of practically every timber available in the market, including a special exhibit of British Empire Timbers, supplied by the Empire Marketing Board, paints, glass, door furniture, grates and fireplaces, wall and floor covering materials, casement windows, &c.

The Building Centre offers very great advantages to the architect, but to the builder and the general public its value will be equally, if not more, important. It will be possible to see under one roof all the things that interest them in building. In addition to the enormous amount of time saved by one visit to the Centre, there will be a resultant acquaintance with new materials, novelties in decoration and equipment, and with many things the existence of which one would not otherwise be aware of.

The Gas Display.

The British Commercial Gas Association, in co-operation with the Gas Light and Coke Company, have arranged a very comprehensive series of exhibits to demonstrate in a striking manner the considerable part that gas can play in modern house furnishing and equipment.

On the ground floor a special section has been set aside for the Gas Industry, and a wide range of appliances is to be seen—all in working order. Examples are shown of the G.L.C. thermostatically-controlled drying cabinet, the "Freezolux" gas-operated refrigerator, set flush in the wall, domestic storage water heaters, including the "Sunhot" and the "Equator," together with several varieties of gas cookers in mottled enamel finishes, and in various sizes. "Newlyn" and "Fox" water heaters are in evidence, the gas iron, and also a number of gas fires in attractive tiled surrounds, including the "Sunbeam" and inset and panel models, the "Panella" being a prominent example of the latter. The lighting is particularly good, being effected in one case by Sugg's ventilating ceiling unit in frosted panel fitting, switch controlled, together with pendant fittings actuated by the new Horstmann catalytic mechanism, whereby the by-pass is dispensed with entirely.

Examples of modern gas radiators are also displayed, including the "Indusa" heater, Cannon's "Beacon" radiator, and Wright's new "Consol" apparatus in an attractive walnut finish. In addition a fireplace setting is completed by the installation of a "Mainscreen" portable gas fire.

On the lower ground floor is a further extensive range of gas appliances, a feature of which is the fact that they also are all fitted up and in working order. In an attractive decorative setting is a Kempton gas-ignited coke fire in chromium finish, a Wright's portable "Tourist" heater, and also a "Raybowl" heater, these appliances ably demonstrating the convenience of the plug-in gas connections, which, incidentally, are liberally placed throughout the gas exhibits. Examples of gas table and standard lamps illuminate the setting, while other sections on this floor are lighted by distance-controlled Evered chromium panel fittings.

Hot Water and Central Heating.

Examples of large water heating apparatus include Potterton's No. 2 "Emperor" boiler, thermostatically controlled, and a similar sized Ruud thermal storage heater of 38 gallons capacity. A National Radiator Company's "Ideal" central heating apparatus is used alternatively with an oil-fired installation for the heating of the whole premises.

Further water heating appliances include the "Ascot" multi-point heater, the "Vivo," and the "Treasure," while in another section is a "Clarkhill Minor" gas heater and also examples of large and small coke boilers. A Jackson's café set shows what gas can do in the catering line, the apparatus having an output of some 240 pints of boiling water per hour, with the supplementary hot milk and coffee sets on either side. One of the fireplace settings on this floor is fitted with a "C.C." alternative gas or solid fuel grate.

A further gas section contains examples of gas washboilers, including the Dean, complete with "Acme" wringer, also a "Freezolux Minor" air-cooled gas refrigerator, a gas incinerator in mottled enamel finish, a gas fire setting complete in cast coloured surround, together with a screen heater manufactured by Messrs. Lighting Trades and the Welsbach Light Company, Ltd.

As a whole the gas display is a very creditable one and

should be of considerable value to the Industry, who are indebted to those by whose co-operation it has been brought about.

The Building Centre is a Permanent Exhibition, but exhibitors will be constantly changing their exhibits. It will not be possible to buy anything at the Centre, but it will be possible to decide where and what to buy.

Scottish Junior Gas Association.

(Western District.)

The following syllabus has been arranged for October-December, 1932:

Oct. 8.—Presidential Address of Mr. Samuel M'Gown, Dalmarnock Gas-Works, Glasgow.
,, 22.—Visit to Messrs. W. & B. Cowan, Meter Works, Camden Street, Glasgow.
Nov. 5.—Joint Meeting with Eastern District. Edinburgh. "Some Notes on the General Design and Operation of Continuous Vertical Retorts," by Mr. C. A. Poulsen, West's Gas Improvement Company, Ltd.
,, 19.—Visit to the Glenboig Fireclay Works, Glenboig.
Dec. 3.—"Tar and Liquor Separation," by Mr. A. R. Anderson, Alexandra.
"Control of Retort Bench Vacuum," by Mr. William Campbell, Helensburgh.
,, 14.—Visit to the "Glasgow Herald" Offices, Glasgow.
,, 17.—Annual Social, Ca'doro Restaurant, Glasgow.

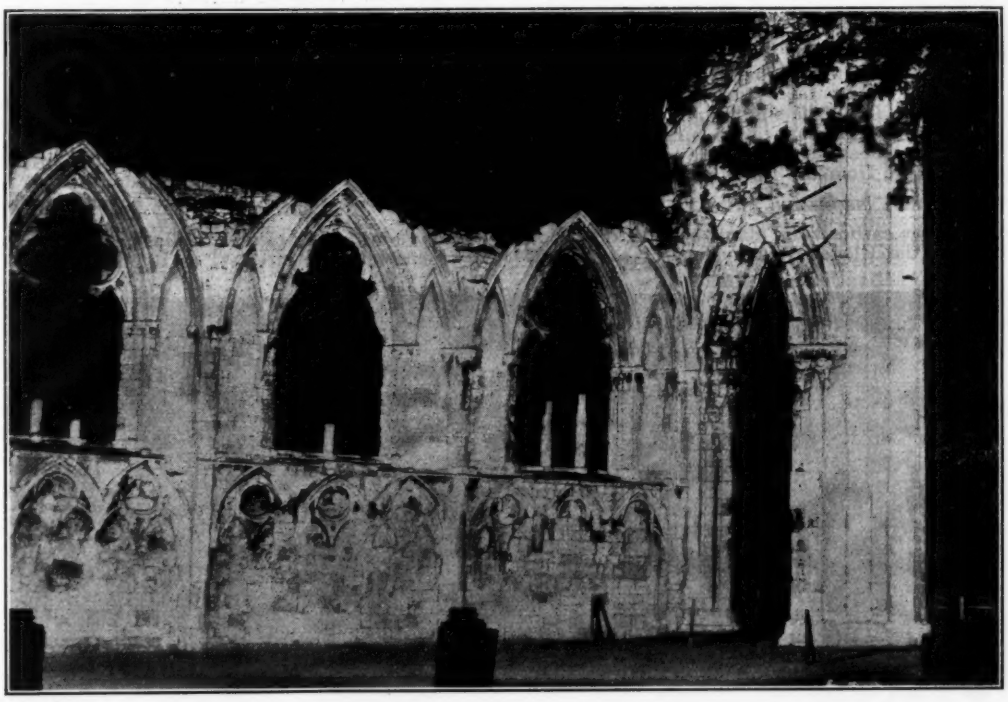
Effect of Gas upon Trees.

We learn from the "American Gas Association Monthly" that Dr. Carl G. Deuber, Assistant Professor of plant physiology at Yale University, recently announced the results of research work that he has done in connection with the effects of gas on tree growth.

Gas, hitherto thought to be deleterious to growth, has been found by Dr. Deuber to be a valuable stimulant when administered in small doses. Large amounts, however, over a long period of time cause death to the plants, he found. Shade trees, subjected for two days to a mixture of air and gas, the gas comprising one-fifth of the volume, were budding and unfolding leaves in a normal manner within two weeks. Control trees left in the greenhouse opened their buds after six weeks. Dr. Deuber made a series of experiments during February of this year to determine early symptoms that could be associated with gas injury, so that the possibility of applying remedial measures might be investigated. A large number of dormant potted trees of various species of from one to four years old were available in the greenhouses of the Department of Botany.

Among other things, Dr. Deuber says, "When the roots of dormant potted red and black oak trees were washed free of soil and sealed in an atmosphere of illuminating gas, with the stems and bodies exposed to the greenhouses, it was found that the bodies were hastened into active growth three or four weeks in advance of control trees, whose roots were sealed in an atmosphere of air."

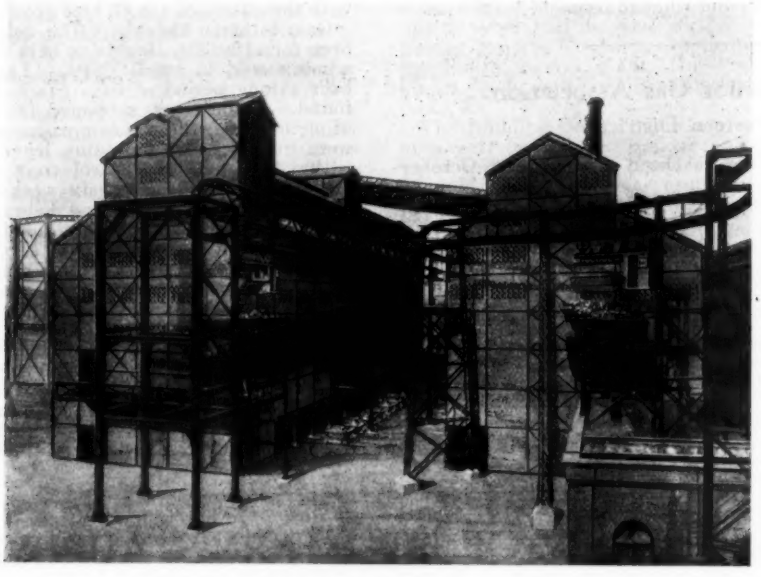
FLOODLIGHTING OF ST. MARY'S ABBEY, YORK



Visitors to York in connection with the British Association meeting were able on Wednesday last to see the floodlighting by gas of St. Mary's Abbey, and the grounds of the Yorkshire Museum in which it stands. The original Church of the Abbey, which was founded by William Rufus in the eleventh century, was destroyed by fire in 1137. *The ruins now seen are those of the Church, the building of which was begun in* 1271, *while the Roman wall and the multangular tower date from* 108 A.D., *although the upper part of the tower is medieval. The lighting is the biggest gas floodlighting scheme ever carried out. The installations were made by Mr. H. E. Bloor, Engineer, Manager, and Secretary to the York Gas Company. The gas is supplied through two 2-in. pipes, and the total number of lamps used is* 82. *Thirty-four of these are fitted with twelve mantles, five with six mantles, one with three, and forty-two with one. The total candle-power is* 50,000, *but by using stainless steel and chromium reflectors, the directional candle-power is trebled. The reflectors are of the dispersed type to ensure evenness of distribution. The chief difficulty of the lighting, stated Mr. Bloor, was to prevent the light from the lamps causing a glare in the eyes of spectators. This has been overcome by placing metal shades and small shrubs to act as shades on each side of the lamps. A feature of the floodlighting is the illuminating of a grove by five high-powered searchlight type lamps, each fitted with six mantles, which were grouped in the centre of the grove. Of the lamps used for the floodlighting, twenty-four were designed by Mr. Bloor, and the others were designed by Messrs. Foster & Pullen, Ltd.*

NEWCASTLE-UPON-TYNE*

Development of Gas Production in the Durham Coalfield



THE FIRST AND SECOND INSTALLATIONS OF GLOVER-WEST VERTICAL RETORTS AT THE ELSWICK GAS-WORKS, NEWCASTLE-UPON-TYNE.

The Elswick Gas-Works of the Newcastle-upon-Tyne and Gateshead Gas Company were brought into operation in 1859 with some 224 horizontal retorts and a gasholder of ¾ million c.ft. capacity. The site adjoins both the river and the railway, but the rail connection with the surrounding collieries is so excellent that the whole of the materials are transported to and from the works on terra firma.

The Carbonizing Plant.

The whole of the carbonizing plant now in operation at Elswick is on the Glover-West system of continuous vertical retorts, the first instalment of which, erected in 1912, was one of the earliest installations on that system of any considerable size. It consisted of 80 retorts, 27 in. by 10½ in. by 25 ft. long, fired by producers with horizontal bar grates. These retorts were probably the first continuous vertical retorts to deal successfully with the carbonization of Durham coals. Since their installation they have been kept in continuous operation to the present day. In 1914-15 the second vertical retort plant was constructed, consisting of 96 retorts 33 in. by 8 in. by 21 ft. long. Last year one bench of 40 retorts in the first installation was converted to the new steaming model, and at the present time the conversion of the second bench of 40 retorts is in progress.

This re-modelling of an installation already 20 years old is of considerable interest, as it embodies the extension of a retort house with a daily capacity of 2½ millions to one of 4,200,000 c.ft. within the same retort house building, on the same ground area, and with comparatively little more expenditure than would, in any case, have been necessary to rebuild those portions of the plant which must be renewed after so long a period of service.

AN AIR VIEW OF THE ELSWICK GAS-WORKS.

The successful carbonization of Durham coals in continu-

* From "West's Gas."

ous vertical retorts has always been looked upon as the "acid test" of design and operation. During the 20 years working at Elswick, over 4 million tons of unscreened coals have been dealt with, and, at the present time, the production of 75 therms per ton at a calorific value of 500 B.Th.U. from mixed Durham gas coals is being maintained without any difficulty. In the reconstruction the whole of the retort bench has been completely renewed, with the incorporation of every improvement in the Glover-West system, including improvements in retort construction, retort settings and heating, coal-feeding, gas offtakes, and collecting mains, and coke-discharging mechanism.

With each retort bench a waste-heat boiler, capable of producing 8730 lbs. of steam per hour, has been installed. These boilers are of the Spencer-Bonecourt induced-draught, fire-tube type, and are fitted with all the latest in the way of automatic control.

The whole of the coal and coke handling machinery within the retort house is electrically actuated, there being three sets of gas-engine-driven dynamos in connection therewith.

The Newcastle-upon-Tyne and Gateshead Gas Company is justly renowned in the Gas Industry for its progressive and successful sales policy. The chief offices of the Company, with an imposing suite of showrooms, occupy a commanding position in one of the principal shopping streets of the city. The literature issued by the Company, including a very fine series of "Year-books," is distinguished by an artistic taste and a vigorous spirit, which has, no doubt, contributed to the success achieved. The lighting of many of the principal streets on both sides of the river is in the hands of the Company, and the vast numbers of domestic and industrial appliances which are in use in the area should be a great encouragement to those who are convinced that gas can, and should, occupy the premier position in every market for heat and light.

T. A. T.

CARBURETTING VALUES OF GAS OILS*

A New Method for Their Evaluation

By A. Holmes, Standard Oil Company of New Jersey, Elizabeth, N.J.

(*Concluded from p. 460.*)

From what has been said, it appears that, instead of relying upon a gravity and boiling-range restriction, a more satisfactory gas oil is apt to be obtained if the range of gravity is restricted, and if only a minimum boiling-point is required. This results from the fact that for a given gravity the best oil is the one which has the highest boiling-point. This will be seen in Table IV. in which oils are compared which have approximately the same gravity but different boiling ranges.

Table IV.—*Carburetting Values vs. Boiling Range with Constant Gravity.*

Run.	Sample.	Distillation.						Gal./M. for 530 B.Th.U. Gas.
		Gravity. ° A.P.I.	I. B.P. ° Fahr.	Temp. at 50 P.Ct. ° Fahr.	At 650° Fahr. Vol. P.Ct.	F. B.P. ° Fahr.	Av. B.P. ° Fahr.	
54	SO-OO	43·0	562	684	0·5	..	685	2·09
34	PA-OO-XFAT	43·2	450	564	91	725	566	2·21
33	PA-OO	41·9	345	543	95	702	542	2·38
40	COL-CS_2-XFAT	41·5	370	450	100	565	453	2·45
41	MRL	35·6	575	683	10	757	688	2·24
39	COL-CS_1-XFAT	35·8	440	531	92	708	541	2·45
56	BLTO-OO	33·6	390	466	100	596	471	3·27
57	BLTO-CS	33·5	400	460	100	575	462	3·62
32	PGOE-52	32·7	165	655	47·5	746	652	2·45
50	WT-CS-FA	32·7	324	470	100	598	470	3·46
31	PGOE-30	30·8	454	689	10	738	684	2·45
27	COL-CS-2	30·9	380	457	100	541	458	3·69
44	PA-OO-SE	27·8	355	548	91	718	545	3·15
51	WT-CS-FB	28·1	473	517	100	578	520	3·27
29	PGOB-30	25·7	296	720	1·5	777	716	2·85
45	WT-OO-SE	25·7	385	575	69	740	578	3·34
55	V-OO	19·2	592	706	6	738	706	3·16
46	COL-OO-SE	19·0	234	540	76	703	543	4·60

These figures clearly indicate that, for a given gravity, oils having the highest average boiling-point are almost invariably the most efficient for water-gas enrichment. A closer inspection of the above data shows that oils with a low gravity and a high boiling range are often better than those having a higher gravity and lower boiling range. In fact, if the average boiling-point of an oil is above 700° Fahr., it appears that the gravity of the oil can be around 22° A.P.I. and still show a consumption of not more than 3 gallons for a 530 B.Th.U. gas.

Nevertheless the gravity and average boiling-point are of great use to those who are attempting to grade gas oils by means of a few physical tests. For those who have avoided the difficulties involved by the use of physical properties in the evaluation of these oils through actual carburetting tests in the laboratory, the discussion so far may be of only passing interest, but carburetting tests in the laboratory consume considerable time and are otherwise more or less expensive, so that efforts are constantly being made to devise more economical methods for gas oil evaluation. In attempting to work out a different analytical procedure for determining the carburetting value of a petroleum distillate, it is realized that one is entering an assiduously investigated field. Since the writer has not endeavoured to make a survey of the literature on this subject, what follows will undoubtedly be considered incomplete; but from contacts with various workers in the field it appears that the present chemical methods of gas oil analysis are not entirely satisfactory. The realization of this situation led to an investigation on the part of the authors, which had for its object the development of either a more accurate method of analysis or one having the same accuracy as those now current, yet which would be more rapid and therefore more economical.

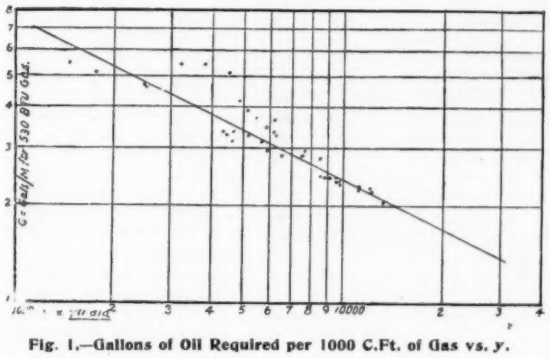


Fig. 1.—Gallons of Oil Required per 1000 C.Ft. of Gas vs. *y*.

Any chemical method of analysis of petroleum oils generally endeavours to estimate the relative amounts of the four main groups of hydrocarbons which are normally present—namely, paraffins, naphthenes, unsaturates or olefines, and aromatics. For carburetting purposes the sulphur, nitrogen, and oxygen compounds are of negligible importance. In order to determine the relative amounts of the four groups of hydrocarbons, the following qualities have been considered at various times: Gravity or specific gravity, viscosity, heating value, aniline point, refractive index, extraction with acids, extraction with solvents, boiling-point, and molecular weight.

No one of these factors, with the possible exception of the treatment with acids, is sufficient by itself for the separation of the four groups of hydrocarbons; therefore recourse must be had to various combinations of these qualities. The establishment of what may be deemed the

* Presented before the Division of Petroleum Chemistry at the 81st Meeting of the American Chemical Society, Indianapolis. [Published in "Industrial and Engineering Chemistry."]

most suitable combination generally resolves itself into a more or less tedious task of "cut and try," assisted to a certain extent by the worker's conception of the behaviour of the various groups of hydrocarbons under the conditions of carburetting. The present investigation followed the usual procedure to a certain degree.

Dispersion Towards Light.

In reviewing the utility of the various qualities possessed by hydrocarbons, such as those listed above, for determining their carburetting value, it appears that the dispersion towards light is the most useful. The dispersion as used in this work is the difference in the refractive indices of the oil for the C and F lines of the solar spectrum (the red and blue lines of hydrogen) at 100° Fahr., which the standard refractometers are equipped to determine. This property is not only very easily determined, but, by properly combining it with specific gravity, factors can be obtained which are characteristic for the four main groups of hydrocarbons. Table V. based upon values given in the International Critical Tables, will serve to illustrate the nature of these factors.

Table V.—*Dispersion Factors for Various Hydrocarbons.*

Hydrocarbon.	(T) Boiling Point °C.	(*d*) Density $\frac{20°\,C.}{4}$	(H) Dispersion $N_F - N_C$ at 20° C.	(Col. A) $\frac{d}{\text{Dispersion.}}$	(Col. B) $(1-d)d$ Dispersion.
Paraffins—					
2, 2, 3-Trimethylbutane	81	0·691	0·0068	101·7	31·4
4-Methylheptane	118	0·722	0·0070	103·1	28·7
n-Octane	125	0·712	0·0069	103·0	29·6
4-Ethylheptane	139	0·741	0·0071	104·3	27·0
n-Decane	174	0·747	0·0075	99·7	25·2
Dipropylethylmethane	221	0·761	0·0075	101·5	24·2
Mean of available data	..	..	..	101·6	..
Naphthenes—					
Cyclohexane	81	0·779	0·0072	108·0	23·8
Hexahydrotoluene	103	0·764	0·0076	100·3	23·7
o-Dimethylcyclohexane	129	0·779	0·0076	102·3	22·6
Mean of available data	..	..	..	103·3	..
Olefins and acetylenes—					
2, 4-Hexadiene	82	0·718	0·0167	43·0	12·1
Dipropargyl	85	0·805	0·0122	66·0	12·9
n-Amylacetylene	111	0·738	0·0087	84·8	22·2
n-Hexylacetylene	125	0·756	0·0089	85·0	20·7
a-Decylene	172	0·749	0·0090	83·1	20·9
a-Hexadecylene	274	0·789	0·0084	93·9	19·8
Unsaturated naphthenes—					
1, 3-Cyclohexadiene	81	0·842	0·0131	64·3	10·2
1, 2, 3, 4-Tetrahydrobenzene	83	0·810	0·0095	85·3	16·2
1, 3, 3-Dihydro-*p*-xylene	136	0·830	0·0116	71·5	12·2
1, 2, 3, 4-Tetrahydronaphthalene	207	0·971	0·0169	57·5	1·7
Aromatics—					
Benzene	80	0·878	0·0167	52·5	6·4
m-Xylene	139	0·865	0·0158	54·7	7·4
Pseudocumene	170	0·870	0·0158	55·0	7·2
Hydrindene	177	0·965	0·0168	57·5	2·0
Hemimellitene	177	0·895	0·0157	57·0	6·0
1, 2, 3, 4-Tetramethylbenzene	204	0·901	0·0157	57·4	5·7
a Methylanthracene	200	1·101	0·0541	20·4	−2·1
Naphthalene	218	1·145	0·0287	39·9	−5·8
Dibenzyl	284	0·984	0·0187	52·6	0·8
Acenaphthene	278	1·024	0·0293	35·0	−0·8

A detailed discussion of the various deductions which have been made by the use of the above-mentioned data is beyond the scope of this paper, but it is felt that an inspection of these figures will justify the conclusion that they are sufficiently significant to form the basis for evaluating gas oils. Since the carburetting efficiency of an oil should increase with its boiling-point, the average boiling-point has been combined with the expression under heading column B to give the relation which is a function of the carburetting value. This takes the form,

$$y = \frac{T\,(1-d)\,d}{H}$$

where y = a number which is a function of the number of gallons of oil required per 1000 c.ft. of finished gas, having a desired B.Th.U. (530 in this investigation) per c.ft. when using a 300 B.Th.U. blue gas.
d = specific gravity (at 100° Fahr.).
H = light dispersion of oil (at 100° Fahr.).
T = average boiling point of oil, usually in ° Fahr.

By plotting y vs. gallons of oil required per 1000 c.ft. of finished gas, having 530 B.Th.U. per c.ft., on logarithmic paper, a straight line is obtained, as can be seen in fig. 1. The straight line in this plot can be expressed with sufficient accuracy by

$$G = 238\,y^{-\frac{1}{2}}$$

where G = gallons of oil required per 1000 c.ft. of 530 B.Th.U. gas.

It will not be attempted to give the large amount of experimental data connected in order to produce the results represented by this curve. A similar curve will be obtained when producing a finished gas having any other desired B.Th.U. than that used in these experiments.

Chemical Method.

Of the various chemical methods which have been used for the analysis of gas oils for carburetting purposes, that by Mighill[1] apparently has attained the most extensive application so far in America. In order to compare this method with the one which has been proposed in this paper, the analyses of a series of oil by the Mighill method were obtained. The results from the two methods can be seen in Table VI.

From these figures it appears that the proposed method is not only as accurate as the chemical method, but that from the data on oil COL-CS.2 it is more applicable to the poorer stocks. Since the proposed method comprises only three short determinations—namely, the specific gravity, dispersion, and average boiling-point—it has an advantage over the chemical method from the standpoint of ease and time required.

Conclusion.

1. The introduction of the boiling range of 400° to 700° Fahr. into gas oil specifications imposes unnecessary limitations, since a gas oil having a given gravity improves as the boiling-point increases, and there are suitable gas oils available which boil outside the stated limits.

2. Gas oils cannot be selected universally upon the basis of a gravity and boiling-range requirement.

3. The carburetting value is best determined by means of a laboratory carburetting equipment.

4. In lieu of the actual evaluation of gas oils in a laboratory apparatus, their values can be ascertained either by the Mighill method of chemical analysis or by the new dispersion method which has been developed.

5. The dispersion method evaluates an oil from three quantities—specific gravity d, dispersion H, and average boiling-point T. The gasification value of the oil apparently takes the form of

$$G = 238\left[\frac{T\,(1-d)\,d}{H}\right]^{-\frac{1}{2}}$$

G being the gallons of oil required per 1000 c.ft. of a 530 B.Th.U. finished gas, d and H being determined at the same temperature (100° Fahr.), and T expressed in °Fahr.

6. The dispersion method is equally as accurate as the chemical method and has the advantage of being more easily carried out and of requiring considerably less time.

Table VI.—*Comparison of Chemical and Dispersion Methods of Gas Oil Analysis.*

Run.	Sample.	Proposed Method.				Chemical Analysis (Mighill Method).					Gal./M. for 530 B.Th.U. Gas.				
		Sp. Gr. at 100° Fahr. = *d*.	Dispersion at 100° Fahr. = H.	Av. B.P. = T.	$y = \frac{T\,(1-d)\,d}{H}$	Unsaturates.	Aromatics.	Naphthenes.	Paraffins.	Available for Enrichment.	Found.	Calcd., $G = 238y^{-\frac{1}{2}}$.	Difference.	Calcd. from Chem. Analysis.	Difference.
				° Fahr.						P.Ct.					
28	BYY	0·838	0·0084	476	7,690	12·0	22·9	19·7	45·4	73·0	2·94	2·71	−0·23	2·86	−0·08
23	COL-OO	0·862	0·0105	585	6,630	14·0	18·1	46·2	21·7	65·1	2·85	2·92	+0·07	3·07	+0·22
27	COL-CS2	0·857	0·0114	458	4,930	12·0	33·4	18·6	36·0	68·1	3·69	3·39	−0·30	2·94	−0·75
45	WT-OO-SE.	0·886	0·0125	578	4,670	23·3	24·5	22·9	29·3	62·6	3·34	3·48	+0·14	3·20	−0·14
16	WT-OO	0·861	0·0080	571	8,540	17·3	19·0	30·6	33·1	67·3	2·80	2·57	−0·23	2·98	+0·18
33	PA-OC	0·801	0·0089	542	9,710	2·0	7·8	12·6	77·6	90·4	2·38	2·42	+0·04	2·25	−0·13
38	COL-OO-XFAT	0·826	0·0078	590	10,870	3·3	0·0	34·8	61·8	85·8	2·28	2·28	0·00	2·37	+0·09

Literature Cited.

[1] Mighill, T. A., Proc. Am. Gas Assocn., **1927**, 1454.
[2] Murphy, E. J., Gas Age-Record, **65**, 389 (1930).

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

BENZOLE PURIFICATION BY ELECTROLYTIC OXIDATION.

"Das Gas- und Wasserfach," 1932, 75, 649 (Aug. 6), contains an abstract of a paper by Gluud, Löpmann, and Keller (Berichte der Gesellschaft für Kohlentechnik, 4, 82) dealing with a new method for the purification of benzole.

1-2 parts of benzole are mixed with 1 part of 15-20 p.ct. sulphuric acid which has no purifying action but acts chiefly as a conductor for the current. The mixture is electrolyzed in an autoclave, the anode space being stirred. The active oxygen formed frees the benzole from the greater proportion of the resin-forming materials. The only additional treatment required is a final wash with water and dilute caustic soda. The degree of purification depends on the time of treatment and, to a large extent, on the current density at the anode, the best material for which is lead. All benzoles are not equally amenable to the treatment. It seems that purification proceeds best in presence of the fractions boiling above 145° C. Possibly complexes are formed between the high-boiling resin-forming cumarone compounds and the low-boiling, readily resinifiable, unsaturated compounds. The process, for which a patent has been applied, is being further developed by the Bochum Benzole Association with a view to its adaptation to all practical requirements.

DETERMINATION AND CALCULATION OF THE VISCOSITY OF GASEOUS MIXTURES.

L. Zipperer and G. Müller, in "Das Gas- und Wasserfach," 1932, 75, 623-627, 641-644, and 660-664 (July 30, Aug. 6, and Aug. 13), discuss the question of the viscosity of gaseous mixtures with special reference to the viscosity of coal gas.

Simple formulæ are developed for the viscosity of gases at different temperatures over the range − 10° C. to + 40° C., and the various formulæ which have been proposed for use in the calculation of the viscosity of mixtures are critically examined in the light of the authors' experimental determinations. It is found that Zipperer's approximation formula,

$$\nu = \frac{100\nu_m}{(O_2 + CO_2 + CH_4 + N_2) + 2(CO_2 + C_nH_m) + \frac{1}{2}H_2}$$

may be used for calculating the kinematic viscosity ν of a coal gas. The chemical symbols indicate the volume percentages of the various constituents, and ν_m is the average of the kinematic viscosities of O_2, CO_2, CH_4, and N_2.

For Karlsruhe town gas (CO_2 2·5, C_2H_4 2·3, C_6H_6 0·4, O_2 0·3, CO 8·7, H_2 43·8, CH_4 23·5, N_2 18·5 p.ct.), the absolute viscosity in C.G.S. units at 20° C. was found to be $139{\cdot}6 \times 10^{-6}$. For coal gas, the relation between the kinematic viscosity and the temperature over the range − 10° C. to + 40° C. may be expressed with good accuracy by the formula,

$$\nu_t = \nu_{20}\left\{1 + 0{\cdot}006\,(t - 20)\right\}.$$

The conditions under which viscosity measurements may be carried out by means of the Bunsen-Schilling apparatus fitted with a capillary were worked out.

THE JUNKERS PORTABLE CALORIMETER.

W. Wunsch and H. Seebaum describe in "Das Gas- und Wasserfach," 1932, 75, 644-647 (Aug. 6), a new portable calorimeter made by the Junkers Company.

The calorimeter, which does not require connection to a water supply, has a central cylindrical portion containing the insulated calorimeter proper and a gas chamber. The latter becomes filled with the water passing from an overhead storage vessel during a determination, this water having first passed through the calorimeter by way of a constant level device. For a determination. the water which has, during a previous test, become saturated with the gas, is displaced into a basin by the agency of the gas entering the gas chamber from a supply pipe. When the chamber is full of gas, the water which has collected in the basin is emptied into the overhead storage vessel. During the actual test, the water flowing from this vessel into the gas chamber via the calorimeter serves to force the gas through the burner. Steady temperature conditions are reached at the end of one minute, and the quantity of gas in the apparatus suffices for a further flow lasting two minutes, during which time the inlet and outlet temperatures of the calorimeter water are read. It is easily possible to take five readings of each thermometer. The volume of gas burnt is equal to the volume of water which has passed through the calorimeter, and the calculation is thus an easy one. A factor which takes into account radiation losses and the temperature of the outer air must be applied in addition to the usual tabular factor. The net calorific value of the gas may be obtained in addition to the gross value if the water resulting from the combustion of the gas is measured.

Tests carried out with the apparatus indicate that the results are in good agreement with those obtained with the standard Junkers calorimeter. The apparatus is especially useful in connection with spot tests for controlling the operation of gas-making plant. The two water vessels serve as covers for the projecting fittings of the calorimeter body when the instrument is packed for carriage.

THE USE OF THE HABER-LÖWE INTERFEROMETER IN COKE-OVEN AND GAS-WORKS PRACTICE.

H. Schildwächter, in "Brennstoff-Chemie," 1932, 13, 301-305 (Aug. 15), describes the use of an interferometer for various analytical purposes, including the determination of benzole in benzolized and debenzolized gas, sulphuretted hydrogen in unpurified gas, and ammonia in unpurified gas. The principle involved depends on the difference between the refractive index of the gas when a given constituent is present or absent.

A benzole determination requires but a few minutes, whereas other methods occupy much time. For the test, the gas is divided into two streams; one is dried by passage over calcium chloride, and the other is debenzolized by passage over active charcoal and also dried. The two streams then pass into the two cells of the interferometer. A drum is rotated until the black interference bands coincide, and the reading is noted. The zero reading is subtracted from this and the corrected difference is proportional to the benzole content of the gas reduced to standard conditions of temperature and pressure. For crude gas, the main gas stream, before being divided, is purified by passage through a tar filter, dilute sulphuric acid, cadmium chloride solution, and picric acid solution.

For the determination of ammonia in crude gas, the gas, prior to being divided into two streams, is passed through a tar filter. One stream is passed to a cell of the interferometer via a vessel containing solid caustic potash; the second stream proceeds to the other cell, having passed through dilute sulphuric acid and solid caustic potash.

For the determination of sulphuretted hydrogen in crude gas, a similar procedure is adopted. The gas is first freed from tar fog in a tar filter and from ammonia by dilute sulphuric acid. One stream passes over calcium chloride and the other through cadmium chloride solution and then over calcium chloride.

THE NAPHTHALENE CONTENT OF GAS FROM INTERMITTENT CHAMBER OVENS COMPARED WITH THAT OF GAS FROM HORIZONTAL RETORTS.

O. Holmqvist in "Das Gas- und Wasserfach," 1932, 75, 700-701 (Aug. 27), describes an investigation on the naphthalene content of the gas produced at Orebro in horizontal retorts and in intermittent chamber ovens. With similar carbonizing temperatures, the naphthalene content of the gas leaving the final coolers at a temperature of 63° Fahr. was 12 grains/100 c.ft. for the horizontal retort gas, and only 5·3 grains/100 c.ft. for the intermittent chamber gas. The percentage naphthalene saturation of the cooled gas ranged from 85 to 100 p.ct. in the case of horizontal retort gas and from 40 to 47 p.ct. in the case of intermittent chamber gas.

The Brockwell Seam in Durham*

The Department of Scientific and Industrial Research has issued a further report in connection with the complete survey of the physical and chemical properties of our national coal resources, which is being undertaken by their Fuel Research Board, with the object of providing data for the utilization and marketing of the coal of the country to the best advantage. The present report deals with the Brockwell seam of the Durham area of the Northumberland and Durham Coalfield, which field covers an area of 800 square miles, and from which the average output in the last few years has been 50 million tons per annum.

The work was generally directed by the Northumberland and Durham Survey Committee consisting of representatives of the Durham and Northumberland Coalowners' Association, noted scientists, and industrialists.

"The Brockwell seam," the report states, "outcrops in the west of the area along a north and south line through Mickley, Blackhill, Tow Law, and Witton-le-Wear, and in the south from Cockfield eastward to Shildon; from here to the coast the southern outcrop is concealed beneath a cover of newer rocks. The group of measures between the Brockwell and the overlying Harvey or Beaumont seam is very productive of coking coals over the western districts of the Durham field, where the Brockwell is considered to be of especially high quality. In the coastal districts of east Durham the Brockwell becomes much thinner and is not mined. The seam is present and passes under the same name in Northumberland, where, however, it has lost much of its coking property; its examination has not been pursued north of the Tyne.

"Just south of the Tyne the seam is very persistent and has an average thickness of 3 ft. 6 in., gradually thinning to the east. In this area, and over most of the Durham field, the seam has a characteristic structure. The greater part consists of very soft bright coal, 2 ft.-3 ft. thick, which is so highly cleated that it has a crushed appearance. This tender coal breaks easily into thin slabs and columnar fragments at right angles to the bedding planes, and a slight concussion is usually sufficient to reduce it to slack. The ash content of this part of the seam is, in general, very small; other characteristic features are the number of fusain partings and the almost entire absence of durain. Beneath the bright coal there often occurs a band of harder coal rarely exceeding 6 in. in thickness. This harder band contains no fusain but has a much higher ash content than the bright coal above it; where the ash content is not unreasonably high, it is mined and filled away with the bright coal. Occasionally a layer of stony or dirty coal, 3 in.-4 in. in thickness, occurs adjacent to the roof; if mined, this is usually filled away separately—more often it is left in position or returned to the goaf.

"There is, in the central parts of the Durham coalfield, an area over which the seam, although yielding a high-grade coking coal, is thin and poorly developed. This area lies east of the river Derwent and is bounded by Pelaw and Burnopfield in the north, and Durham and Consett in the south.

"The Brockwell seam so far described is almost free from dirt partings, ankeritic material, and pyritic inclusions. It is very valuable for coking purposes, but the tender nature of the bright coal and its high swelling properties render it only second-rate as a household fuel.

"Approaching its southern outcrop the seam attains its maximum development, reaching a thickness of 7 ft. 7 in. in the neighbourhood of West Auckland, but the character of the coal changes. The typical division into soft bright coal above and hard coal below, found in the northern part of the area, disappears, and the coal becomes much less friable and the constituents more interbanded. In addition the content of volatile matter becomes higher, and it is extensively used for gas manufacture, steam raising, and as a domestic fuel in the south, as well as for coking purposes."

The results of detailed laboratory analysis and tests on 25 samples consisting of pillars of coal cut from floor to roof of the seam, taken from various points well distributed over the whole area covered by it, are summarized as follows:

The proximate analysis results, on an air-dried basis, show that the moisture content is very low, the average figure being 1·3 p.ct. and only one sample containing more than 1·7 p.ct. The lowest figures are those from the neighbourhood of Newcastle (0·9 p.ct.), and from here there is, in general, an increase westwards and southwards.

Although the percentage of ash varies somewhat irregularly, it is, on the whole, remarkably low, no sample exceeding 7·6 p.ct. and 16 out of the 25 samples being below 4·5 p.ct. The bright coal, which forms the greater part of the seam, is consistently very low in ash content.

The proportion of volatile matter, expressed on a dry ash-free basis, varies between 24·8 and 34·7 p.ct., with one exception which contains 37·7 p.ct. From an area in the west, where the figures are low, there is a general tendency to increase to the north, east, and south. The hard, dull coal from the bottom of the seam, where present, generally has a higher volatile matter content than the bright coal above it.

In the ultimate analysis, expressed on a dry ash-free basis, the carbon figures show considerable regularity, ranging from 85·5 to 89·5 p.ct. There is little difference between the carbon content of the bright coal and that of the dull coal. The hydrogen figures all fall between 5 and 5·3 p.ct., with one exception, which contains 5·5 p.ct. The amount of nitrogen in the seam is fairly constant, ranging from 1·4 to 1·8 p.ct. The sulphur content is everywhere remarkably low, rarely reaching 1 p.ct. The percentage of phosphorus is, in general, very low.

The calorific value is very high throughout. The figures, expressed on an air-dried basis, range from 15,210 to 13,870 B.Th.U. per lb. Calculated to dry ash-free coal, the values show remarkable uniformity, the highest and lowest figures being 15,710 and 15,010.

The fusion point of the coal ash, determined in both a reducing and an oxidizing atmosphere, is very high, being above 1400° C. in the majority of samples.

In the low-temperature carbonization assay the seam as a whole exhibits very strong caking properties, the cokes produced being excessively swollen, porous, and fragile. The gas and tar yields are moderate. The highest degree of swelling is shown by the bright friable coal which forms the greater part of the seam. The thin layer of hard, dull coal often present at the base of the seam only produces a non-swollen (or slightly swollen), strong, hard coke; when included in the average sample it does not appreciably affect the general coking properties.

The Brockwell seam throughout Durham produces one of the most valuable coking coals, being suited in every way to this use. On account of its fragility and relatively low volatile matter content it tends to be less used as a domestic fuel or as a gas coal, except in the south, where two of the samples are of somewhat harder coal, and one shows a considerably higher percentage of volatile matter.

* Summary of Fuel Research. Physical and Chemical Survey of the National Coal Resources No. 24 "The Northumberland and Durham Coalfield, The Brockwell Seam," published by H.M. Stationery Office, price 2s.

Register of Patents

Gas Fires.—No. 375,094.

PARKINSON STOVE COMPANY, LTD., and ANGUS, H. T., both of Stechford, Birmingham.

No. 20,201; July 14, 1931.

This invention has for its object to provide an improved gas fire of the kind in which a plurality of radiants are supported against a firebrick back in a rearwardly inclined position. It comprises the combination with a firebrick back having a concave and rearwardly inclined front surface, of a plurality of concave radiants supported side by side on the back; also the combination with the fire, above the burner, of a corrugated reflector.

In one manner of carrying the invention into effect, the burner is so arranged that the axes of the gas nozzles are inclined at an angle of about 40° to the horizontal. At one side of and above the burner is arranged the firebrick back. This has a front face which in vertical cross section is of concave form, studs or other projections on the front face being provided to support the radiants, which are also concave in shape. In horizontal section, the back may be straight, concave, or convex. The curvature of the radiants is such that immediately adjacent to the burner they are coaxial with the burner nozzles, and at other parts they bend upwards in a curve which approximates to that which the flames naturally assume. In other respects the radiants are of the fretted form which is now usual in gas fire radiants.

At the front of the fire and immediately above the burner is arranged a metal reflector. In cross section this is corrugated so as to present to the fire surfaces from which radiation can be reflected upwards into the room. In the event of fracture of the radiants the pieces remain in position on the back. The firebrick back, burner, and reflector are carried in any suitable frame or body.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Association of Public Lighting Engineers

PRESIDENTIAL ADDRESS AND GAS PAPERS PRESENTED

At the Ninth Annual Meeting in Blackpool—Sept. 5 to 7

PRESIDENTIAL ADDRESS

of Mr. HAROLD DAVIES (Chesterfield).

When I became a member of this Association, and later was nominated and elected to membership of its Council, I was in honour bound to assist every effort which it could put forward in support of the aims and objects for which the Association was founded.

Our Association is still young, yet each year it grows stronger, and the need for such an organization is being fully realized. It will be my duty during the next twelve months to make its usefulness more widely felt. It is a great honour which you have done me in electing me as your President. I thank you, and will do all in my power to be worthy of your trust and confidence.

At the outset, I ask myself, " Why have you placed me in this position? " and the answer, I think, is plain. It is because I represent a very large proportion of our members mostly employed by smaller municipalities in dual capacities.

Some few months ago I had the opportunity of studying a very interesting tabulation of the replies to a questionnaire sent out on behalf of this Association, and I find that out of 132 cities and towns in the United Kingdom included in the schedule, 11 employ whole-time Lighting Engineers to control and supervise Public Lighting, and 121 are engaged in a dual capacity, Surveyors, Chief Constables, Gas or Electrical Engineers, and others, being linked up in the responsibility. It is not, of course, for me to say when the duties and responsibilities of the public lighting engineer become of necessity a full-time position, but of this I am convinced, that some of our cities, and many of our larger towns, would achieve much better results in public lighting without additional cost by having at the head of this service a full-time technical officer with a high standard of training and ability for his job.

I think the time will shortly come, if it has not already arrived, for this Association to consider what steps can be taken to prepare an educational scheme for the sound guidance of aspiring public lighting engineers, the summit of which might well be the Diploma of our Association, with entrance into the ranks of full membership.

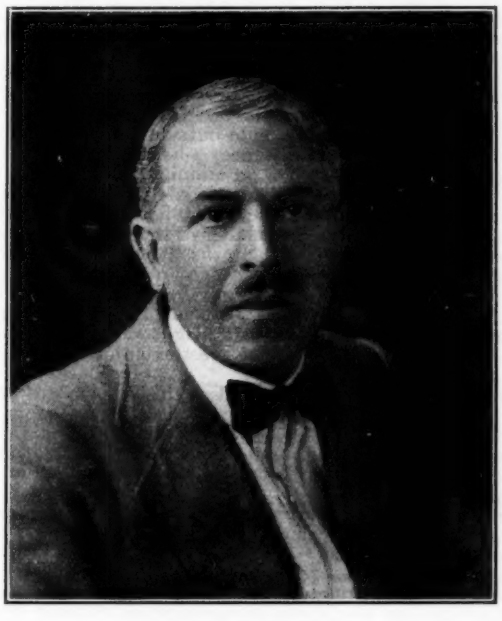
I have been both directly and indirectly connected with public lighting for nearly forty years, and during the past twenty years the public lighting of two towns has come under my supervision for re-organization; and I propose to recount very shortly some of the activities of the Street Lighting Committee of the Borough of Chesterfield.

Prior to 1921, the area of the Borough was 2643 acres, and by an Order in 1920 was extended to 8468 acres, and has now a population of about 64,000. It was then that the formation of a suitable Committee to deal with Public Lighting was a problem readily dealt with, and the solution in my opinion proved eminently successful.

Watch, Highways, Gas, and Electricity Committees were asked to appoint two representatives each, and the Committee's recommendations and resolutions covering matters relative to public lighting are submitted like all other minutes, whether of Statutory or non-Statutory Committees, to the whole Council in Committee.

GOOD LIGHTING A CIVIC ASSET.

Estimates of the annual expenditure are submitted in the month of January, covering the period of twelve months to the end of March in each year. Such estimates cover the cost of gas, electricity, materials for maintenance, labour for maintenance, cleaning, &c., cost of additional lighting, and a sum to be spent annually in improving the existing lighting of the town. Many of you will know what generally happens to estimates after they have left the respective Committees with their blessing. The experience in my town is no exception to the general rule, but a good fight has been put up against undue curtailment of expenditure upon public lighting, and gradually, but surely, it is, I think, being realized that good public lighting is an asset to the town, and that a reasonable expenditure ought to be provided for the carrying out and improvement of the service.



THE PRESIDENT,

HAROLD DAVIES, M.Inst.Gas E., of Chesterfield.

Trained under the late Mr. J. R. Frith of the Runcorn Gas Company, Mr. Davies was subsequently appointed Assistant Gas Engineer and Manager at Darwen, Colne, and Blackburn, later becoming Engineer and Manager to the Brighouse Corporation Gas Department. In 1919, he took up his present position of Gas Engineer and Manager at Chesterfield. In all the towns mentioned he came into intimate contact with all matters relative to public lighting. A keen member of the Association of Public Lighting Engineers for many years, Mr. Davies has acted on the Council of that body since its inception.

The renewal of out-of-date lanterns and equipment is of first importance, and should be specially provided for in the estimates by way of maintenance, and not allowed to encroach on the amount provided for improvements; and with this explanation the costing can be kept under the respective heads of the estimate.

The public lighting of Chesterfield was a subject of much controversy in the year 1882, when electric lighting was first installed, and electricity is now the medium of lighting in the central area.

Chesterfield, I believe, can claim the distinction of being the first English town to adopt electricity wholly as a means of street lighting. The streets were lit in 1882 by Brush arc and Lane Fox incandescent lamps, the electricity

being supplied by a central station using Brush machines. The arc lamps, 40 in number, were each of 2000 c.p., and the 320 incandescent lamps were each of 15 c.p.

At a later date, when the above plant became obsolete, the Corporation arrived at an agreement with the local Gas Company for the public lighting of the town.

The present electric street lighting dates back to 1902, and there are now 32 street lighting fittings in use in the principal streets of the town. Twenty-eight of these are suspended from poles 22 ft. high, planted on the edge of the footways, and four are fixed 22 ft. over the centre of the roadways, suspended from span wires. Five 1000 watt, twenty-five 500 watt, and two 300 watt lamps are in use. The total length of streets illuminated by the above is 1¾ miles.

The suspension lanterns are fitted with dome type asymmetric prismatic refractors, eight lanterns are fitted with symmetric bowl refractors, six with directional bowl type prismatic refractors, and the remainder are without refractors. These are gradually being replaced by lanterns fitted with refractors, since with refractors the illumination midway between the standards is more than doubled, with, of course, less directly underneath the lantern.

The remainder of the public lighting in the Borough is by gas, and for some years prior to 1930 I had been steadily replacing old lanterns. In that year I was able to submit to the Committee a scheme which would provide at least 50 p.cent. increase in total light output at little additional cost. The gas lighting now consists of the following:

2	15-light	No. 2	mantled	inverted	lanterns		
1	9-	,,	,,	,,	,,	lantern	
127	6-	,,	,,	,,	,,	lanterns	
1	12-	,,	bijou	,,	,,	lantern	
6	4-	,,	No. 2	,,	18-in.	upright lanterns	
907	2-	,,	,,	,,	16- ,,	,,	,,
93	4-	,,	bijou	,,	18- ,,	,,	,,
29	2-	,,	,,	,,	16- ,,	,,	,,
7	Miscellaneous lamps for lighting conveniences, &c.						
1173	Total						

These are arranged so that along the main roads the intensity of illumination is increased as the centre of the town is approached, 6-light inverted gas lamps being used within three-quarters of a mile outside the electrically lit area; and beyond that distance, 4-light bijou square gas lanterns, all reducing 50 p.ct. at midnight. Important road junctions have 6-light No. 2 inverted gas lamps installed, and those of lesser importance have 3-light No. 2 gas lamps, burning all night. The remainder of the thoroughfares are lit with 16-in. square gas lanterns fitted with two No. 2 mantles, burning all night.

Six-light lamps have a mounting height of 17 ft. to light sources, and 4-light lamps 13 ft. 6 in., 2-light lamps being generally 12 ft. Lamps 15 ft. in height and over are maintained by men using portable trestles adjustable up to a height of 20 ft.

The small capital cost involved on this scheme was £3122, and the Ministry of Health sanctioned borrowing powers involving the repayment of the loan in ten years. The expenditure covered automatic clock controlled lighting for all gas lamps, and the provision and equipment of new lamps where necessary.

The purpose of the proposal was to make better use of the money provided from the rates for the objective for which it was intended, and the readiest way of achieving this result was to transfer some of the heavy costs entailed in lighting and extinguishing. Perhaps at this juncture I might give you the items of expenditure covered by the loan:

	£
Main road lighting—	
1. New 6-light inverted suspension lamps, and fixing same to existing standards or tramway poles, including alterations to services	271
2. New 4-light 18-in. square lanterns, including fixing to required height on existing standards	289
3. Automatic clock controllers for the above	213
Lighting of other roads—	
1. New 16-in. square lanterns, fitted with two No. 2 mantled burners, including fixing to existing standards	1278
2. Alterations to other lamps, including brackets	125
3. Automatic clock controllers for the above	801
	£2977
Equipment for maintenance and inspection	£145
Total	£3122

All clocks are fitted to run sixteen days with one winding, and winding and setting is done once each fortnight.

Cleaning and maintenance is continuous, except in bad weather, and each lamp receives a visit for this purpose at least once each fortnight, except in special cases where conditions are such as to necessitate extra attention, when more frequent visits are regularly made. Supervision and inspection is given by one foreman provided with a motor-cycle, and night lighting inspection by three men provided with cycles, who are part of the staff mentioned below.

Police reports of failures in lighting are given without delay to the central and district police stations, and communicated by telephone to the central lighting office day or night, so that attention may be given the same evening. All such failures are confirmed by special postcards provided for each police station, indicating the number of the lamp which is visible in each lantern, and from which the foreman is informed of the exact position of each lamp affected.

During the year, the police reported "out" or "defective" 1212 lamps—*i.e.*, an average of 3·3 lamps per day or 0·28 p.ct. of the total number of lamps lit. The Lighting Department attended to the following lamps "out" or "defective."

Main roads—
832 lamps, an average of 2·3 lamps per day, or 0·19 p.ct. of the total number of lamps lit.

Other roads—
1790 lamps, an average of 4·9 lamps per day, or 0·42 p.ct. of the total number of lamps lit.

Analysis of work—

Lamp cleaning	49·2 p.ct. of total time worked
Clock winding and setting	23·9 ,, ,, ,, ,,
Service	13·3 ,, ,, ,, ,,
Inspection	10·9 ,, ,, ,, ,,
Miscellaneous	2·7 ,, ,, ,, ,,

Lighting failures on gas suspension lanterns were 1·0 p.ct., and 50 p.ct. of these were due to by-passes and 20 p.ct. to naphthalene. These were reported immediately after lighting hours and given attention the same evening.

On square lanterns, failures were 0·5 p.ct., and 50 p.ct. of these were due to naphthalene and 25 p.ct. to by-passes.

During the year, 36 clocks out of 1173 have had to be returned to the makers under guarantee, due to mechanical defects, 25 p.ct. of which were broken main-springs and the remainder minor defects.

In connection with service, the time now spent on this has been reduced to 8·8 p.ct. of the total time worked owing to the installation of naphthalene extracting plant at the gas-works, and will be still further reduced.

A little difficulty has been experienced with the gas valves of automatic controllers gumming up, and in order to overcome this, a small plant has now been installed at the gas-works for the extraction of gum, and the little trouble will now be eliminated.

The maintenance of the electrical installation is dealt with by the Electricity Department.

All gas lamps are maintained by employees of the Gas Department, and for most of the work a special staff of one foreman, six men, and one youth are regularly employed.

The cost of all labour, material for maintenance, renewal of installation and service, new and additional lamps, &c., is charged monthly to the Street Lighting Committee.

Each lighting unit is provided with service and maintenance record cards for the lamp and clock controller, and it is the duty of the foreman to keep the information on these cards up-to-date, and to present each day for the inspection of the management the cards of all lamps receiving attention during the previous day. This information is obtained from Daily Works Sheets which are issued to the workmen. A Daily Sheet is also submitted of all defects, so that a complete record may be tabulated monthly and annually.

Any communications or reports having reference to improvements in or additions to the Public Lighting are first considered by the Committee, who meet monthly (except in the month of August); and where the subject requires inspection and further report, this is deputed to two or more members of the Committee along with the Lighting Engineer, and recommendations made thereon to a subsequent meeting of the Committee.

The total amount allocated from rates for public lighting during the current year is £5033, or 4·21d. in the pound on the net assessment, and includes £250 for normal additions to the number of public lamps, and £750 for improving existing lighting in any direction which may be deemed necessary or desirable; and this is the second year only for the Committee to be allowed any sum specifically towards improvements. The money is, as far as possible, being used for the much needed improvements required in lighting certain of our main roads which carry a large volume of heavy traffic.

In addition, small-scale experiments are constantly being carried out with any special lighting equipment deemed worthy of investigation.

Actual Expenditure During the Year Ended March 31, 1932.

	£	s.	d.
Labour	1046	12	5
Mantles	170	14	1
Globes	6	16	11
Renewals of lamps, services, &c.	231	5	4
Additional lighting and improvements	752	1	4
Gas	1321	4	5
Loan charges	441	0	0
Electric lamps and standards, electricity, wages, repairs and maintenance, fittings, lamps, &c.	535	0	0
	£4504	14	6

One of the big obstacles to improved public lighting in a town like Chesterfield is the difficulty, not to mention expense, of re-spacing lighting units. I suppose our experience is the same as in most other towns, where road junctions have determined the position of many lighting units, and the spacings between them have been very varied. There is now a better appreciation by many municipalities of the necessity, especially along main roads, of considering the lighting of such roads as a separate unit, and leaving side street junctions to be dealt with quite apart; and this I feel sure will be all to the good.

Street Lighting Specification.

At this juncture, it would perhaps be opportune for me to say a few words with reference to the British Standards Institution's Street Lighting Specification, which was revised and reprinted last year and is again in the hands of the Committee for revision. Being a member of this Committee, I certainly feel some measure of responsibility for the drafting of the amended specification. The making of this publication as useful as possible in every direction of public lighting has, I can honestly say, been foremost in the minds of every member of the Committee; and I am sure it is the wish of the Committee to make the specification cover most of the possibilities of public lighting.

The purchaser of light only for street illumination needs to be assured that he is getting that light regularly and evenly over the area and during the lighting hours. The contractor who supplies the equipment needs the conditions under which his installation is to function assured of a certain standard of power and of maintenance, and last, but not least, is the authority who is called upon to purchase the installation and power, and to maintain to the specified classification. I think it will be found necessary and even desirable to start with a classification which can and must be regularly maintained.

It is not my desire to forestall in any way the work of the Committee, but I can tell you that their deliberations are creating greatly increased interest all round in public lighting matters, and I am sure will yield a satisfactory contractual basis and a good guide to the principles of the subject.

It was my intention to say a few words here about the possibilities of linking up the Alphabetical Classification given in the existing specification with a descriptive classification of streets, but I find this very controversial, and therefore more for general discussion, and probably you will find an opportunity later of expressing your views on the subject. Personally, I should like to see some such linking up, as a guide to what standard should, if possible, be aimed at in different types of thoroughfares, &c. This brings me to a point which has to be appreciated—that the responsibilities for, and attaching to, public lighting do not lie evenly upon the shoulders of all ratepayers within the British Isles. Perhaps it is as well that they do not, still I think it is highly desirable to give every assistance and enlightenment to more backward authorities in matters of public lighting.

As I have previously submitted, the general standard of illumination in almost every field of lighting is very much higher than it was before the war, and there is surely the necessity in our streets, where the traffic conditions have been made so much more difficult, for a similar advance. Yet I doubt whether the standard is such that it bears favourable comparison with the marked strides of lighting in other directions either by gas or electricity. There are exceptions, of course, but what I would stress, particularly in these times of industrial distress, is that economy in street lighting is inadvisable if it leads to a diminution of efficiency.

It is difficult to estimate the value of good street lighting, and its cost is often looked at with varying degrees of uncertainty, even of its necessity, but surely it must be admitted that such lighting has a material influence in reducing traffic accidents, and the consequent economic loss; and there is no doubt also that loss due to burglary and theft is reduced thereby. From figures which have been published in the U.S.A. it is estimated that the saving by really good lighting throughout the country would pay for nearly double the expenditure needed, and no doubt an equally good case could be made out for public lighting in this country. I have, during the past twelve months, been presenting the views of some of our members before the Road Transport Congress and the National Safety-First Congress, and I then urged the desirability of co-operation in obtaining detailed statistics showing the beneficial effects of good lighting.

Pooling of Experiences.

Each town and city could do something in this direction, and the pooling of experiences would be invaluable. The benefits of public lighting are so widespread that they often pass unrecognized by the individual citizen, and authorities in these times are naturally inclined to economy and apprehensive of additions to the rates. It is therefore to the influence of enlightened public opinion that we must look to bring about the much needed improvements.

Our Association has done much to interest public opinion, and still more to show the way to municipalities who have in many instances taken a very keen interest in the practical and scientific papers and discussions which our Association has put forth since its inception.

And now, if I may be allowed to digress for a few moments, I should like to refer to certain matters in connection with public lighting by gas.

There is no doubt that the Gas Regulation Act of 1920 has done much to ensure more uniformity in calorific value and pressure of gas, and very few, if any, towns would fail to offer a regularity of gas supply for public lighting, which, with modern equipment, would provide the necessary illumination for efficiently lighting our streets. I would, however, like to see gas lamps and burners of every design submitted to some central testing authority, where all the conditions of public lighting would be known, and where the lamps, &c., would be called upon to withstand such conditions before the pattern could be certified as efficient and suitable for the purpose for which it is designed. Gas mantles also for public lighting should, I think, have some hall-mark of efficiency.

I have no doubt some of the larger authorities will not feel the need for this, but I am speaking more particularly of those smaller, but more numerous, authorities who are called upon to carry out public lighting without being in a position to undertake accurate scientific tests *in situ*.

Organization is, of course, something which even the smallest local authority expects in its control of public lighting, but technical equipment and staff, while being necessities, are more often than not considered luxuries which cannot be afforded. Such being the case, we have to rely upon outside sources for information of a technical character, tests of lighting equipment, and the like; and I now wish to express my appreciation of the personal assistance which has at all times been fully given both by my colleagues in this Association, and my profession, and also by manufacturers of equipment.

ADMINISTRATION OF PUBLIC LIGHTING.

By R. H. Minshall (Chairman of the Sub-Committee of Street Lighting, City of Sheffield).

[Extract.]

I.

Much of the work of the City Councillor is in administering National Laws, in seeing that the enactments of the State are efficiently and economically carried out in his own city. This applies in Police matters, in Public Health, in Education, in Public Assistance, and so on. But in Street Lighting, in England, we have a free hand. The Public Health Act of 1875 says we " may " light the streets. In Scotland the Local Authorities are compelled to do so.

This freedom to light or not to light does not lessen our responsibility. It increases it. We get no State guidance and we get no State financial help. The amount of money we can induce our Finance Committee to give us for this important and necessary public service is entirely governed by our own local public opinion. An educated and discriminating local public opinion is, therefore, essential if good street lighting is to be obtained and maintained. Therefore, it is a fundamental duty of Associations such as this to do their share in the necessary education and enlightenment. The Public Lighting Department has been far too long the " Cinderella " of the Municipality. The Lighting Engineer is still to some benighted and befogged minds only a glorified lamplighter. The importance of his work in my opinion justifies his claim to be considered a chief official, and this should resultantly carry an adequate salary. He should be a fully qualified Lighting Engineer in sole control of his department under his committee, but not subordinate to any other department or committee. The work of a Public Lighting Department must necessarily be associated frequently with the Cleansing, Highways, Estates, Police, and Fire Brigade, and the Public Lighting Engineer should co-operate with all these, but not in a subordinate manner.

I feel that it is the duty of the Association of Public Lighting Engineers to emphasize the need for the appointment of a fully qualified Lighting Engineer in all towns and cities.

The blind devotees of a narrow-visioned economy may urge that it is an unnecessary expense; but I am certain that it is advisable to have an expert Public Lighting

Engineer, and I am certain it is economically advantageous. May I quote a few figures from my own city, Sheffield? The cost per candle has been reduced since the appointment of a Public Lighting Engineer from 2s. to 6¼d. The burning hours increased from 3509 per annum to 3720 per annum. The candle power per head of the population has been increased from 0·95 to 4·60, while the cost per head has only been increased from 22·94d. per annum to 29·31d. per annum—an increase of 348 p.ct. in candle power and 28 p.ct. in cost. During that period, the entire lighting plant of the city has been overhauled, and, among other improvements, over 13,000 clock controllers for gas lamps and electric time switches for electric lamps have been installed. All this expenditure has been covered by our Revenue Account.

In 1923-24 there were 11,324 gas and electric lamps in use with a total candle power of 500,000, whereas in 1931-32 there were 20,192 gas and electric lamps with a total candle power of 2,352,000.

Surely these figures must convince all unprejudiced persons!

II.

How should a Lighting Committee be constituted? Should it be a Sub-Committee of another Standing Committee, and if so, which? Should it be a Standing Committee itself? Which Committees are specially interested in Public Lighting?

(*a*) The Finance Committee, as it must find the money to do something for which there is no legal obligation.
(*b*) The Gas Committee, as they wish to supply the illuminant.
(*c*) The Electric Supply Committee, for the same reason.
(*d*) The Highways Committee. Roadmaking and road-lighting have a good deal in common. The importance of the reflecting qualities of road surfaces for good visibility in artificially lighted streets is becoming increasingly recognized. Then, of course, the Highways Committee are interested because of the disturbances of roadways and footpaths in the erection or re-arrangement of street lamps and in the laying of pipes and cables to feed them.
(*e*) The Watch Committee is certainly interested, as it is recognized that good street lighting is of great service to the Police in the control of traffic, and in the prevention of crime. It has been said that one street lamp is worth five policemen.
(*f*) The Housing or Estates Committee, because they want their new housing schemes adequately lighted. In some cities the Housing Committee must pay for the initial cost of the street lighting installation.
(*g*) The Transport Committee, because well-lighted tram and 'bus routes are necessary for safety. In many places, tram poles are used as lighting poles.
(*h*) The Public Health Committee is particularly interested in the lighting of courts and suchlike places.

I am myself distinctly of opinion that the work of the Public Lighting Engineer should be under a separate Committee. The Public Lighting Engineer should be in an independent position, and in no circumstances associated with the Gas or Electricity Department.

III.

Even with the greatest economy I fear the amount spent on street lighting must increase. Higher and ever higher standards of illumination are being, and will continue to be, called for. The increase in the volume and speed of traffic, and the interest now shown in the Safety First Movement will demand it. There is a growing recognition on the part of the public that good street lighting means increased safety, increased comfort, and that it is a powerful deterrent to certain forms of crime.

On financial grounds alone, I feel that greater attention should be paid to street lighting by the City Councillors throughout the country.

IV.

As there is no Government grant and no local standard to which one must conform, it is extremely difficult to make comparisons between one city and another in the cost, quality, and quantity of their street lighting.

The Lighting Rate is no guide, as the rateable values on which rates are based differ so much.

The amount per head of population is perhaps better, but obviously one cannot compare the amount per head in, say, the City of London with any provincial city.

The cost per candle is not an infallible guide, as I believe there is no generally accepted method of assessing the total candle power of any city's lighting system, and comparing one city with another.

Cost per mile of roadway does not help us, as the proportion of main street to side or residential street differs from town to town.

Each Local Authority is, therefore, more dependent on its own experience in street lighting than it is in any of the other essential services.

All lighting improvements in Sheffield have been financed out of Revenue Account—that is, out of the Current Rates. I understand that in some parts of the world loans are obtained for this purpose. How the money is obtained is more properly a question for the Finance Committee, but I should imagine that if the usual period of repayment of 30 to 40 years is adhered to, the street lighting plant, or at least parts of it, will be badly out of date long before the loan is paid off. The system savours too much of the hire-purchase system to be commendable to me. After all, lighting improvements and developments are constant. That has been our experience in Sheffield during the past eight years.

As a strong advocate of and a firm believer in Municipal enterprise, I hope that in this country we shall not attempt to rely upon private sources for defraying the cost of public lighting. The experience given us from the United States of America does not encourage me to support private enterprise in this essential public service. Let us frankly face our moral responsibility—I regret it is not a legal responsibility—to light our roads, lanes, and courts adequately. The cost is not excessive. In this, as in most cases, you get better value for money paid in rates than in any other expenditure. Taking five Midland towns with populations ranging from 230,000 up to 520,000, I find that the cost varies from 7s. to 2s. 6d. per head per annum, averaging 4s. per head of the population. This cannot be considered excessive expenditure for the benefits conferred.

V.

There are a bewildering number of considerations to take into account when one is deciding on the lighting of a new area or the improvement of an area or street already lighted. For example:

(*a*) The present standard of illumination if the street is already lighted.
(*b*) The standard of illumination to which it must be brought to give satisfaction—that is, the class in the British Standard Specification into which the lighting should fall.
(*c*) The cost of the various schemes.
(*d*) Should provision be made for future increase in illumination, merely by the substitution of units of higher candle power, and without other additional capital expenditure?
(*e*) The effect on adjacent streets or areas to be lighted, already lighted, or to be re-lighted.

If the Committee responsible is to base its decision on knowledge, and not do its work in an offhand and haphazard way, it is clear that this Committee must have the assistance of a fully qualified Lighting Engineer to furnish it with all the relevant facts and figures on which it can form an opinion. It is equally clear that if these facts and figures are to be dependable, the official must be provided with the necessary testing and measuring plant—that is, the Lighting Department must have an adequately equipped photometric laboratory.

The Lighting Committee has not finished its work or discharged its responsibility when it has authorized a new lighting scheme or an improved lighting scheme. It is responsible to the City Council for the continued good lighting of the city streets, lanes, courts, &c.

The Lighting Department for which the Committee is responsible must, therefore, be adequately staffed.

VI.

And now we must consider the status of the Lighting Department in which is included the status of its chief officer, the Public Lighting Engineer.

I would like to say a word on the extension of the duties and responsibility of the Public Lighting Engineer. In most cities and boroughs, he is appointed as Public Lighting Engineer, having responsibility and control only as regards the lighting of streets, courts, squares, &c. I would urge that he should be the Lighting Engineer for the city or borough, and that his sphere of usefulness be extended by including the lighting of schools, libraries, museums, police courts—in fact, all public institutions.

VII.

I am becoming convinced that ultimately public lighting will require some kind of national control. Here, therefore, we are at once up against the danger of destroying local autonomy. As a beginning I give my whole-hearted support to the suggestion that an Advisory Council should be appointed to explore the whole question. On such a Council your Association should be represented.

PUBLIC LIGHTING OF COLCHESTER.

By H. COLLINS, Borough Engineer and Surveyor, Colchester.

[EXTRACT.]

The cost of public lighting in the Borough of Colchester is only 4½d. in the £1, as against an average of 6d. in the £1 for Boroughs.

The Electricity Works are owned by the Corporation, the Generating Station being modern, having been completed in 1927. The Corporation have also an extended area for the supply of electricity which extends to the coast. In connection with the National Grid Scheme current will be supplied eventually in bulk from Barking or Ipswich. The Gas-Works are owned by a local Company.

The street lighting of the Borough is effected by means of 657 electric and 717 gas lamps. The electric lamps vary in capacity from 60 to 500 watts; the gas lamps are all of the same power—viz., twin bijou inverted mantles having a consumption of 2 c.ft. per mantle per hour. The price for current is 2¾d. per unit and for gas 3s. 11d. per 1000 c.ft. The declared calorific value of the gas is 470 B.Th.U. per c.ft. For the year ended Dec. 30 last, the expenditure of the Lighting Department amounted to £4676, which works out at close on 2s. per head of the population. The cost of electric current and gas amounted to £2120 or approximately 45 p.ct. of the total cost; wages of foremen, fitters, cleaners, lighters, &c., amounted to £1631, or 35 p.ct. of the total expenditure.

For the same period the cost of maintenance per electric lamp (ordinary) amounted to £3 0s. 8d., made up as follows:

	£	s.	d.
Fittings, materials, paint, &c.		3	4
Lighters, cleaners, &c.		16	4
Fitters		2	3
Wages (painting)			11
Electric current (100-watt lamps) ...	1	15	6
	£3	0	8

The gas lamps during the same period cost £2 10s., made up as follows:

	£	s.	d.
Fittings, material, paint, &c.		3	4
Lighters, cleaners, &c.		19	6
Fitters		2	0
Wages (painting)			11
Gas (twin bijou burners)	1	4	3
	£2	10	0

The total candle power amounts to 151,760, which is equivalent to 3·12 per head of the population.

CONTROL OF PUBLIC LAMPS.

Lighting and extinguishing is, generally speaking, done by lamplighters.

The bulk of the electric street lamps have their own separate service from the mains, though there are a few sections each with its own separate pilot wire.

These were formerly more in number, but as mains commenced to give trouble on account of age, separate services to the lamps or sections were provided and the lamps fitted with automatic controllers. Lamps in the new area of lighting in the outer portion of the Borough are always provided with controllers. The number of automatically controlled electric lamps is 209 and similarly controlled gas lamps 17. Controllers have proved very reliable in practice and a very distinct economy has been effected by their installation.

The gas lamps consist of twin bijou inverted mantles contained in 16-in. square copper lanterns. Many of these lanterns are provided with polished stainless steel reflectors so as to direct the light along the length of the roadway and so utilize it in the most efficient manner. The height of the light point is 8 ft. 6 in. above the surface of the road, but all new lamps of these types in future are to be fixed 13 ft. above ground level.

All lamp posts are fixed by the Department and services laid with the exception of making the actual connection to the mains, which the Electricity Department and the Gas Company do with their own Staff. Records are kept of the life of all the electric bulbs and gas mantles as a check of their quality, &c.

Mantle replacements average about 2⅝ per nozzle, annually, and bulb replacements about one per annum. Mantle replacements are required more frequently on wall bracket lamps, which are generally situated in narrow streets—vibration due to traffic is the cause. Mantles have nearly double the ordinary life in lamps that are fitted with automatic controllers for lighting and extinguishing.

In connection with the National Scheme for Disabled ex-Service Men the Colchester Corporation undertook to employ not less than 5 p.ct. of their number of employees. It has only been possible to do this by using them as lighters, and many, being only one-armed, naturally have not quite the normal control of their torches, and there is consequently greater damage to the mantles. The number of lamps dealt with per lighter averages 90, though in the closer built up areas a rate of 120 lamps per man is reached. Governors were provided on the gas lamps, but were so much trouble through sticking in damp weather that by agreement with the Gas Company they were removed.

In Colchester considerable use has been made of lines painted on the road surface for directing and controlling traffic. It is generally agreed locally that yellow lines are better than white for this purpose, particularly when the road surfaces are wet, as reflections carried by street and motor lights from the unpainted road surface and a white painted surface do not make a sufficient contrast. Under these conditions the yellow lines show up more distinctly than the white; for the same reason brass studs are preferred to stainless steel or aluminium.

STREET LIGHTING OF OLDHAM.

By ISAAC H. MASSEY, Superintendent of Lighting, Oldham.

[EXTRACT.]

Eight years ago the Oldham Town Council created a separate Department to carry out the work of lighting the streets of the Borough.

This work had hitherto been undertaken by the Gas Department, but apart from the actual operating of the installation, very little time was devoted to public lighting, which formed one of the multifarious duties of the Distribution Superintendent. Nevertheless, according to the standards of those days, the town was by no means badly lighted, although in comparison with the many advantages of present-day specialization the service, from both an economical and a modern point of view, left something to be desired. Ultimately the powers decided that, in view of the changed conditions brought about by the increase in road transport, the work ahead, particularly in bringing the lighting of the main roads abreast with the times, could be much better undertaken by a Department entrusted with that one aim.

At this period, March, 1924, the streets were practically all lighted by gas. Square lanterns housing 2 and 3 light low-pressure burners, with a larger unit here and there to meet some special requirement, were in use. A scheme of 1500 c.p. high-pressure gas lighting for one particular main road had, however, just been launched. When the first units were brought into commission, the high mounting height of the tramway standards and the high candle power of the unit, presented a marked contrast to the very low standard for main road lighting as we had known it.

We had, also, an example of what electricity could do towards solving our future street lighting problems, a small 500-watt installation having been fitted up in the centre of the town. The tramway standards formed the medium of suspension. This experiment had been a great success, and it was clear that in any future schemes electricity had justified its claim to a share of the increased lighting load.

The Town Council thereupon outlined a policy which it believed would be the foundation of an efficient service, and at the same time a fair and equitable arrangement which would be approved by the Corporation's supply Departments of Gas and Electricity; the main roads on the east side of the town were to be lighted by high-pressure gas, and those on the west side by electricity.

In a broad sense this arrangement has been quite a good one. The line of demarcation no doubt accelerated the modernizing of our main road lighting, and reduced to a minimum the natural jealousies of the two supply Departments. More important still, the arrangements certainly did achieve distinction by preventing unfair and unprofitable competition which is a problem with so many rival engineers to-day.

CHARGES FOR GAS AND ELECTRICITY.

To justify such an arrangement, naturally, some uniformity in the scale of charges for current and gas is essential. At this period the following rates were in operation:

Gas. 3s. 2d. per 1000 c.ft., less 10 p.ct. discount.
Electricity. 2d. per unit.

So, in point of candle power for candle power, there was very little difference in the respective charges. These

charges were in operation for some time, afterwards to be reduced in stages to the present prices of,

Gas. 2s. 10d. per 1000 c.ft., less 10 p.ct. discount.
Over 65,000,000 c.ft., 2s. per 1000 net.
Electricity. 1½d. per unit.

The greater reduction, it will be seen, has been made by the Electricity Department.

The first four years in the life of the new Department were fairly active ones. Acute trade depression in the town has, however, on many occasions set the financial indicator at "Go Slow," as in other rate aided Departments of the Corporation. Nevertheless, steady progress in modernizing our lighting plant can be recorded. This progress has certainly been more rapid on the electrical side, the Electricity Committee having agreed, when schemes have been drafted, to defray the costs of fitting up the installation. This has been a great inducement to the Lighting Committee to carry out its plans with the least possible delay.

Some idea of the growth of electric street lighting in Oldham can be gauged from the fact that up-to-date we have electrified twelve miles of main thoroughfares in lieu of gas, six miles of which conform to Class F, four miles to Class E, and two miles to Class D of the British Engineering Standards Institution Specification for Street Lighting. The candle power output has increased on these roads by 424,000.

We have also lighted electrically three housing estates and a number of new streets. Altogether our electric lighting installation comprises nearly 1000 lamps with a wattage range of 100 to 1000, equivalent to 18½ p.ct. of total lighting units and 42 p.ct. of total candle power output of entire lighting installation.

In drafting our various schemes for main road lighting, nothing less than the 300 watt lamp per standard, or its equivalent in gas, has been considered adequate. The more important traffic routes and business centres are lighted by 500 watt lamps, and 1000 watt lamps illuminate all busy crossings. The problem of mounting height and spacing ratios has been simplified by the permission of the Tramways Department to fix all our overhead equipment to their standards. The average height of the units is 20 ft., the spacing distance 120 ft., and wherever the standards are available on both sides of the road they are utilized.

Our main road lighting does not include any arrangement of staggering. The units are in most cases fixed opposite to each other on both sides of the road (as a unit of system II., appendix II. B.E.S.A. Specification for Street Lighting, 1931). Where the difficulty of standards exists, and the units are all in line on one side of the road only (as a unit of System IV.), we realize that some loss of uniformity in the illumination between the two sides of the road does exist. We are experimenting with reflecting devices to adjust this balance.

The importance of this point was brought forcibly to our notice some months ago, at a point where a fatal accident occurred on one of our highways, an employee of the Water Department being knocked down by a passing motor vehicle when turning on a street valve.

The lighting arrangements on one road had just been modernized. We had taken down the ordinary gas lamp pillars and square lanterns housing 3-light burners, and installed a 10-light high-power low-pressure gas system with lamps suspended from the tramway standards on one side of the road only. We had increased the candle power fourfold and raised the mounting height of the units from 11 ft. 6 in. to 20 ft., with a spacing height ratio of six to one. The width of the road was only 15 yards, a good Class E road, and not a single lamp was out at the time of the accident. Yet at the inquest on the victim several witnesses stated that the road was badly lighted at the point where the accident took place, which was on the opposite side of the road and midway between the lamps. The foreman of the Water Department was equally emphatic that he saw his man 200 yards away working the valve, so well lighted was the road. Yet the verdict went against us. My opinion was that the atrocious weather conditions prevailing at the time of the accident, heavy rain, with perhaps the presence of moisture on the windscreen of the motor, would reduce visibility, and would largely account for the impression of bad lighting. This would probably be further influenced by the regular reflection of the polished wet road surface, with bright spots and dark spaces outside the direct line of reflection, exposing at the minimum illumination point the weakness of a high diversity of 25 to 1, and the unequal spacing of the units of the installation. Where reasonably low diversity is experienced, visibility is more constant when passing along the street. Rapidly changing degrees of brightness must be very confusing to a motorist travelling at, say, 20 miles per hour, whose eyes are not granted sufficient time for visual accommodation to take place.

The dirt problem in Oldham, as in most industrial towns, is acute, and its influence on street lighting maintenance is a large one. To cope with this we have instituted a system of washing our lamps overhead. A tank is fixed on the tower wagon, from which a supply of water, with a little boiler composition added, is conveyed, by means of a hand pump, through a length of rubber tubing to a specially designed water brush. We find this method much quicker than the leather, and it is a great help in maintaining a high level of efficiency in cleaning. Our electrical installation of 1000 lamps is easily cleaned in the course of a week.

Maintenance of Gas Lamps.

On the gas lighting side, "Efficiency with Economy," I think, accurately describes our activities—efficiency in the provision of high power units on all gas lighted main roads, the scrapping of all obsolete lanterns and the general overhaul of all gas plant, economy by cutting out all unnecessary consumption of gas after midnight. This, combined with the decrease due to our electrification schemes, has resulted in a reduced annual gas consumption of 35 million c.ft. The midnight economies alone amount to 23 million c.ft.—perhaps not a very healthy figure from a gas-works point of view.

The Lighting Department has, in two instances, received valuable assistance from the Gas Department in the defraying of installation costs. The high level of these has no doubt had a retarding influence in preventing more offers of a similar nature coming forward. At the same time we have, in my opinion, one or two of the best examples of gas lighted roads in Lancashire. Prominent among these is Huddersfield Road, where we have fitted a high-pressure gas system of 1500 c.p. lamps, mounted on the tramway standards on both sides of the road. The minimum illumination is equivalent to class C of the Street Lighting Specification.

The maintenance figure of £3 15s. 6d. per lamp compares rather unfavourably with £3 6s. 4d. per unit for low pressure of equal candle power. Our agreed ratings with the Gas Department for the two units are, however, more favourable to the high-pressure. The output per cubic foot of gas is 42·8 candles and that of low-pressure lighting 36·4 candles; the comparative running costs per hour of the two units, including maintenance, is

1500 c.p. low-pressure unit, 1·50d. per hour.
1500 c.p. high-pressure unit, 1·41d. per hour.

The compressing costs are borne by the Gas Department.

For some months following the completion of our high-pressure scheme, we experienced quite a lot of trouble owing to rust from the high-pressure main getting into the lamp gauzes and reducing the efficiency of the lamp. This main had been in disuse for some time prior to fitting up the installation. Eventually the trouble was overcome by opening out the main and getting rid of the accumulation of rust under air pressure. Every high-pressure gas lamp is taken down twice a year for general overhaul (I believe that prevention is better than cure even when it comes to a gas lamp complaint!).

Another well-lighted Class E road, with units of both high and low-pressure gas, is Lees Road. The low-pressure lamps are the 10-light "Rochester" suspension type, with distant control device. We have found this device very satisfactory, although we had some doubt, when the scheme was under consideration, of the effect of condensation in the service tube falling back and making up the pilot gas-way in the control tap. We eventually decided to break the service pipe after the control tap and fix a syphon to receive any condensation. Our experience of the emptying of these syphons is ample justification and a proof of trouble avoided.

High-power low-pressure gas systems have been adopted on several other secondary main roads, with units ranging from 6 to 8 lights, graded according to traffic conditions. In many cases these units are attached to large ornamental swan neck brackets, 13 ft. 6 in. to reflector of lamp. The brackets are made locally to patterns supplied by us and fixed to the ordinary lamp pillar, but, in comparison with our usual practice of fixing similar units to the tramway standard, the diversity factor, due to lower mounting height, was very high. Some reduction of this and the glare factor has been brought about by using the half-frosted globe. My experience, however, is that absolute cleanliness is essential, or lighting depreciation with this globe is very rapid. I find washing them preferable to the use of the leather, whch tends to rub the dirt into the rough surface of the frosted half.

Directional Reflectors.

I have experimented on several roads with directional reflectors of various types, mirror and stainless steel, but

in every case I have fitted 2 ft. extension pieces to pillars, to keep the ray out of direct line of vision as far as possible. This to my mind is most important. An increase in the illumination at a test point, followed by a corresponding decrease in visibility, is of no use. (Amplification of light such as dazzles the eye has as much to recommend it as amplified fresh air furnished in the form of a draught!)

I am gradually dispensing with the enamelled top reflectors in the square lanterns, in favour of porcelain reflectors, which are much easier to keep clean. The burners are all mounted well up in the lantern to give the maximum efficiency from the reflector.

Automatic control of gas lighting has been adopted on 50 p.ct. of the gas lighting installation. This is used for the lighting and also the extinguishing operation at midnight. I have had very little trouble with the mechanism of clocks, the efficiency of performance is 99·8 p.ct., and they have shown a very good return on capital outlay in the form of gas saved. The lighting and extinguishing of remaining lamps is still performed by the lamplighter.

Public Lighting and Safety.

It is, in my opinion, beyond doubt that good street lighting assists in reducing the number of road accidents, although the difficulty in accurately defining its contribution is well known. I have taken a census of accidents which have taken place in Oldham during the past three years. Correlating these with the lighting we have the following typical results:

Lighting Class.	Length of Road.	Accidents.	Vehicles per Hour.	Traffic Risks of "F" to "D."
D	1·6 miles	63	350	28·5 p.ct.
F	0·47 mile	10	100	

Assuming the number of accidents to be proportionate to the traffic risks, I should say D Class lighting figure is much the better of the two. The adoption of similar distances and equal traffic density on both roads, one might venture to suggest, would have resulted in the comparative figures reading:

D Class lighting . . . . . 63 accidents
F Class lighting . . . . . 100 accidents approx.

In summarizing our efforts to get the best results from the expenditure, I think the following figures will be interesting:

Installation.

—	Road Mileage.	Rated Candle Power of Installation.	Candle Power per Lineal Mile.	Candle Power Increase, 1932.
1924 . . .	112	988,990	8,830	43 p.ct.
1932 . . .	116	1,415,690	12,204	
Increases .	4	426,700	3,374	

—	Expenditure.	Decrease Expenditure in 1932.
	£	
1924	29,769	17 p.ct.
1932	24,625	
Decrease	5,144	

The reduced expenditure of 17 p.ct. in 1932, compared with the figure for 1924, includes 9 p.ct. saving on total expenditure which is directly due to lower charges now in operation for current and gas, &c. The large increase in total rated candle power output without any increase in the estimates has been made possible by various departmental economies, involving the elimination of all waste and the use of the full illuminating power of the installation when it is chiefly required—viz., up to midnight.

Although I feel that we have made substantial progress with our street lighting in recent years, there is still much work ahead. Unfortunately one cannot predict rapid developments in face of the financial stringency which exists to-day, and many schemes for improved lighting are unavoidably shelved.

I would apologise for my silence about Oldham's Class A lighting. It does not exist. I am aiming, rather, at a more general uniformity in the lighting of our main roads, such as come high in the Classes of the Street Lighting Specification, due allowance being made for traffic density. I think also, that the art of illuminating engineering should be more apparent in some of our side streets, which are apt to get neglected in our eagerness to deal with traffic problems. The twin No. 2 burner is the standard burner in Oldham for this work. In my opinion some sort of comprehensive zoning plan is needed for side streets quite as much as for main roads. I have in my mind the taking into account of the rateable values of a district which perhaps has some relationship to burglary risks. These considerations, I think, far outweigh any criticism of "class catering" which might be levelled at the Lighting Department.

STREET LIGHTING BY GAS IN BURNLEY.

By J. H. Clegg, M.Inst.Gas E., F.C.S., A.M.I.Mech.E.

[Extract.]

In 1925 a Street Lighting Sub-Committee was appointed by the General Purposes Committee of the Corporation, and formed on the following basis: The Chairman and Vice-Chairman of the Highways and Sewage, Electricity, Gas, and Improvement Committees, with two additional members of the Town Council. The Gas and Electrical Engineers attend the Committee as Technical Advisers and Administrators, and the Borough Treasurer as Financial Officer.

The Sub-Committee is now responsible for "lighting of streets and roads, public places, and the public clocks of the Borough, and for that purpose to regulate and fix the number and the situation of the public lamps, to erect or remove the same, and to determine the method of lighting to be adopted in any particular place."

Prior to 1925 the street lighting of Burnley was controlled by the Gas Committee, to whom the Gas Engineer was responsible for maintaining the scheme, the institution and the provision of additional lamps in odd places which were considered inadequately lighted, or where building schemes necessitated an extension. This method occasioned friction at times when an additional lamp was demanded by electors in a certain back court, through councillors who were seeking re-election and whose claim as to the necessity for an additional lamp was not accepted by the Gas Engineer.

The interests of the Corporation from an expenditure point of view were very carefully watched.

At that time there were 3620 gas lamps in use, and, with the exception of a dozen or so, they were of the 2-light No. 2 inverted mantle type in square lanterns for all front street lighting, and were designed and manufactured in our own workshops. All back courts have been illuminated in Burnley since 1913 by "Falcon" lamps suspended from a swan neck, with the same number and size of mantles. All the lanterns were mounted on short pillars 11 ft. 6 in. in height.

In comparison with many towns, Burnley was at that time extremely well-lighted, with the exception, perhaps, of the centre of the town and some of the main tram routes.

With the addition of 13 electric lamps in use the total annual cost in 1924 was £19,078, which amounted to a rate of 10·83d. in the pound.

The price charged for gas was 3s. 3d. per 1000 c.ft., and for electricity 3¼d. per unit.

Alterations Since 1925.

In 1924 street lighting by hand was completely abolished; 2275 new controllers were purchased and installed, in addition to those already existing, at a cost of £4214. This installation resulted in an annual saving in wages alone of £1377.

The new Sub-Committee very properly decided that the main roads on which were tram routes should have improved lighting, and that the new lamps should be suspended from the tramway standards in order to abolish as many obstructions on the footpath as possible. This work has been carried out in sections spread over the last seven years, and is now nearly completed.

The Electricity Department began to aspire to the honour of illuminating the important thoroughfares, and the Street Lighting Sub-Committee placed all such improvements and extensions of lighting on a competitive basis.

It has always been the practice for the Gas Department to bear the whole of the capital expenditure of the public lighting installation, and charge the Committee with an annual sum per lamp, covering the cost of capital charges, maintenance, and a charge per thousand cubic feet of gas consumed, 6½ c.ft. being the quantity charged per lighting hour for a 2-light No. 2 superheater burner. The competitive tenders had to be submitted on this basis to a standard of lighting laid down by the Committee, after agreement between the Electrical Engineer and the Author.

In the first place test lengths were given to both Departments, although the tender of the Gas Department was the

lower, and these stretches were thoroughly tested out from the point of view of surface illumination, and the Members of the Committee frequently inspected them in order to create their own point of view. It finally resolved into the policy that 1000-c.p. lamps should be erected on the main roads, radiating from the centre, and the remainder were completed with 500-c.p. lamps, in all cases spaced at approximately 40 yards distance with a mantle height of 18 ft. 6 in. for the 1000-c.p. lamps, and 17 ft. 6 in. for the 500-c.p. lamps, staggered where the provision of tram columns permitted.

After very careful consideration the final result is that 4½ miles of this improvement is carried out by the Gas Department and 2½ miles by the Electricity Department, and although the photometric results between the two systems of lighting were agreed to be practically equal, the general expression of public opinion was that gas lighting was the more effective.

In all cases of main street lighting the "Rochester" lamp has been adopted, all fitted with controllers, and in most cases with dual control, which permits of half the mantles in each lamp being extinguished when desired, and with four tappets to permit of two lightings and extinguishings during the twenty-four hours. In the later installations stainless steel directional reflectors are used with unquestionably improved results. Six-light lamps were used for the 500-c.p., and twelve-light for the 1000-c.p.

As the frequent use of a tower wagon was found to be too expensive, and the small hand-wheeled tower dangerous to use in the hilly districts, a raising and lowering gear was decided upon. Our experience of the use of the flexible connection and the type with a break joint at the lantern caused us to devise a type with rigid piping which would overcome these disadvantages. The raising and lowering gear resulted in a member of my staff afterwards taking out a patent in this connection, and it has proved quite effective in use. It is comparatively cheap in first cost, and is not too obtrusive or ugly in appearance. The only drawback which was evident in the first batch we erected was the tendency of some lamps to hang out of truth due to faulty coupling, or to the drying-up of the lubricant, which caused the top swivel joint to become sluggish. This has now been corrected, and later productions have not this drawback.

The winch is placed sufficiently high to prevent interference with the winding rope by mischievous youths, and is easily reached by the attendant with a short ladder. The lantern, however, is lowered sufficiently for the attendant to clean the lamp from the ground. All our suspension lamps are fixed without the use of cup and ball joints.

As far as possible all lanterns were set to project about 6 ft. into the carriageway, and the width of these roads varies between 40 ft. and 60 ft., being, of course, in the category of Class A.

All these lamps are inspected nightly by an attendant who runs along the whole of the routes in a small van, and in order to ensure his safety while attending to the lamps in the dusk, he is provided with a red lamp which he shines on one side whilst he is working; on the other side he is protected by the motor van.

High-Pressure Gas Lighting.

One portion of the tram route lighting, half-a-mile in length, is carried out by high-pressure gas lighting; Keith 1000-c.p. lamps being used. Gas is supplied through a branch taken from the high-pressure main provided for shop window lighting, and at a pressure of 80-in. water column. Alternate lamps are extinguished for restricted lighting. These lamps can be lighted simultaneously and automatically by a clock-operated governor, which admits or closes the supply of high-pressure gas to the branch main, the pilot lights being supplied through the day from a small low-pressure supply which by-passes the governor.

In order to avoid extreme contrasts of lighting on minor 'bus routes which connect up the main roads and tram routes, a higher standard of lighting has been established here. To provide for a minimum of capital expenditure, 4-light superheater burners were fixed in the lanterns, which are spaced at about 35 yd. centres and staggered. The height of the lighting source is raised to 15 ft. 6 in. by the provision of cast-iron extension pieces.

Each burner is fitted with a Multi-ray reflector, and in order to permit of easy cleaning of the lantern, the burner is attached to the controller by a ground joint for its easy removal from the lantern with the reflector attached.

Arterial Roads.

In common with other towns, arterial roads have been constructed during the past few years, and competitive tenders were also obtained for this lighting from the two Departments. The total length of 5¼ miles is lighted by gas.

The type of pillar was specified for each Department by photograph, the pillar to be of steel construction.

The lighting is accomplished by means of 4-light "Rochester" lamps mounted at a height of 15 ft. 6 in. above the roadway, and spaced at 80 yd. centres, all lamps being erected on one side of the road. It is hoped that at no distant date the Committee will double the number of lamps, which would be placed on the other side of the road and intermediate with the existing lamps. These roads will then be lighted in an effective and pleasing manner. The average width of the road is 60 ft.

The whole of these lamps have been fitted with Multi-ray reflectors, which considerably increase the effective candle power for road illumination. Such a device is particularly necessary in arterial road lighting where passing through open spaces, no advantage being obtained whatever in reflection, due to the absence of adjoining buildings. The Author can confirm that it is a most difficult type of illumination, everything being dead-black in the vicinity.

Housing Schemes.

Housing scheme lighting and the development of new estates lead also to competitive tenders being obtained, and with the exception of one installation, they are all lighted by gas. The same type of pillar as mentioned for arterial road lighting was specified, but with a mounting height to mantle of 12 ft. 6 in., with spacing of about 50 yds. centres except in the main avenues, where the arterial type of road lighting is adopted. The shorter spacing is necessary for the small avenues having regard to the proper illumination of the cul-de-sacs, and the numerous curves and awkward corners which are met with on such estates. For the 55 yd. spacing 3-light "Rochester" lamps are used, and the lamps are staggered, the widths of the main avenues being 35 ft. and the branches 25 ft.

Special Lamps.

At all dangerous points in the town, what we term Danger Lamps are installed, and contrary to the usual custom they are actually fixed at the point of danger. At crossings two lamps are erected at opposite corners diagonally, and an endeavour is made to place the lamp on the near side as approached from each direction on the busier road.

These lanterns are painted red and glazed with red and white devices, the columns also being painted red and white.

The effect is very striking, and the sign can be seen plainly from 100 yd. distance in all directions.

These lamps were adopted as a standard six or seven years ago, and were favourably commented upon at the time by the Automobile Association.

The lantern and frog are made in our own works, and the pillars cast locally from our own patterns.

Great difficulty was experienced in obtaining a suitable glassware to give equal visibility in the day-time as when illuminated. This I regard as a very important point, as many danger signs are inconspicuous both in appearance and the position in which they are placed. Often they are situated too far away from the point of danger, causing misjudgment and confusion in the mind of the driver who is a stranger to the district.

These lamps are lighted by four No. 2 mantles.

Shop Lighting.

It will perhaps not be out of place in this paper to mention that it is our practice to let out to consumers 8-light low-pressure or 1000-c.p. high-pressure lamps for shop window illumination, at an inclusive price per lamp for rent of installation, maintenance, and gas consumed for the whole of the lighting period during shop hours. The number of hours provided for is 500, which permits of the use of the lamp during dark or foggy periods in the daytime, the lamps being lighted and extinguished by the consumer. Those shops whose lighting hours are longer than the majority, contract for, say, 600 or 700 hours; a little extra charge per block of 100 hours is made. We have 200 of these lamps in use, and although they do not improve the evenness of public lighting, they brighten up the district where they are installed and attract the public.

Public Clock Lighting.

All the large public clocks in Burnley are lighted by gas. There are four, and they are responsible for a total gas consumption of over 1¾-million c.ft. per annum. The largest clock, surmounting the Town Hall, has four opal dials each 7 ft. in diameter, which are illuminated from the interior by 12 No. 2 mantles to each face.

In all cases the lighting and extinguishing of the gas is operated automatically by mechanism attached to the public clock itself.

Gas has been found to be very suitable for this type of

lighting, resulting in a mellow even illumination of each dial, and the warmth given off from the burning gas is sufficient to maintain the clock room in a suitable condition, preserve the mechanism of the clock, and keep the lubricating oil from stiffening in winter.

We carry out all the public lighting of the adjoining townships—in five parishes—with a total of 236 lamps. The method of charge is exactly the same as in the Borough, except that the price charged for the gas is 2s. 4d. per 1000 c.ft. based on a reducing scale of charge in relation to the increased quantity consumed. With the exception of one parish, through which a tram route runs, we have been unable to induce these Councils to improve their standard of lighting.

Two-light No. 2 mantles per lamp, with a minimum spacing of 120 yards, appears to be their best standard, and any suggestion of an increase in their lighting rate above 2½d. or 3d. in the pound is unthinkable to them. It is becoming imperative that as Class "A" roads pass through these villages and connect them up to towns, they should have a considerably improved standard of lighting, particularly as their rateable value is being substantially increased by the influx of well-to-do residents whose occupation lies in the adjoining towns.

General Statistics.

We have at the present time 3104 front street lamps within the Borough, 652 back street lamps, and 236 outside the Borough, our total being 3992.

The average number of mantles used per lamp is 3·48 per annum, the average number per nozzle being 1·45 per annum.

The number of globes used per lamp is 0·44 per annum, and the number of panes of glass of the ordinary square lantern, 0·65 per annum.

The Electricity Department provide 187 lamps, and the total cost of street lighting to the Burnley Corporation for the year ended March 31, 1932, is £15,463, which is equivalent to a rate of 7·30d. in the pound.

The total consumption of gas for public lighting within the Borough is 86,994,000 c.ft., and the price charged is as follows:

For the first 70 million c.ft. consumed . .	1s. 9d. per 1000 c.ft.
,, next 5 ,, ,, ,, . .	1s. 6d. ,, ,,
Over 75 million c.ft.	1s. 0d. ,, ,,
Average inclusive charge per lamp (gas) per annum (For 475 B.Th U. gas).	£3 14s. 11d.

The lowest price charged for electricity for street lighting is 0·95d. per unit.

[A report of the proceedings at the Conference will be published in the "JOURNAL" next week, and an early opportunity will be taken of dealing with the paper by Mr. F. C. Smith, of the Gas Light and Coke Company, on "The Planning of Gas Installations to Conform with the British Standard Specification for Street Lighting."]

EXHIBITION OF PUBLIC LAMPS AND LIGHTING EQUIPMENT.

Held in the Imperial Hotel, Blackpool, during the Conference of the A.P.L.E.

British, Foreign, and Colonial Automatic Light Controlling Company, Ltd.

(100, Holdenhurst Road, Bournemouth).

This firm is showing a wide range of "Gunfire" gas controllers. Included in the exhibit is a specially constructed controller (known as Type C/L) for main tap operation, provided with a cut-out device to obviate operation on Sunday or any other day, which is entirely automatic in operation.

"Gunfire" controllers are manufactured throughout in the Company's Works at Bournemouth, with the exception of the fully jewelled lever escapements.

Bromford Tube Company, Ltd.

(13, Victoria Street, London, S.W.).

On this stand attention is drawn to six different types of lamp columns which could not be shown in the hall owing to the limited height and which accordingly have been specially erected outside the Imperial Hydro. These are all made from weldless steel tubing and include various designs of plain and fluted shafts. There is an installation of centrally suspended lighting consisting of standard steel poles with cast-iron "Rhondda" type bases. The span in this case is 45 ft. A 13-ft. column with vertically fluted shaft and cast-iron dwarf base is also shown. Then there is a column with a height of 20 ft. 3 in. to point of attachment, consisting of a steel shaft fluted and stepped down, and with a bracket arm 7 ft. long. This type of column has been used for several new installations in London. A cast-iron base completes the general neat appearance. Also exhibited is one of the largest types of steel column made.

William Edgar & Son, Ltd.

(Blenheim Works, Hammersmith, W.C.).

On this stand is the 1932 pattern 6-light "Eclipse" lamp, with upright fixing—a symmetrically designed lamp manufactured from all-British material and embodying the best workmanship. The casing is of heavy gauge polished copper, and the reflector of 20 SWG enamelled steel. The two rings with their hinge and catch for accommodating the globe are of cast brass, as is also the superheater burner box. The rings, burner box, and the external fittings are aluminium metalized to prevent corrosion.

Another exhibit is the "Ionic" circular lantern, which was designed with a view to meeting the demand for a lantern for positions when something rather better in appearance than the ordinary square lantern is called for. Of pleasing proportions and symmetrical shape, it is suitable for lighting principal streets, squares, sea-front promenades, &c. It is a circular lantern, made of stout hardened copper, with stamped copper ornamental fret. Three ribs to body, having brass strengthening rods through entire length of rib. One door to body is provided, hinged at side, with two strong brass wire bolt fastenings. The top is hinged, and when opened engages in a clip which supports it at the open position, leaving both hands free for manipulating burner, cleaning, &c.

The "Caxton P" lantern fitted with hinged top is a square lantern, made of stout hardened copper throughout, with brass strengthening rods through side ribs, and stout stamped brass ornamental corners. The lantern is fitted with special stainless steel or chromium plated steel reflectors, and has one cleaning door hinged at side, provided with strong brass wire bolt fastening. The top is also hinged to furnish a means of easy and speedy access to the burner, &c. An inverted superheated burner of the latest type is fitted, which can be arranged to take No. 1 or No. 2 size mantles as required.

Falk, Stadelmann, & Co., Ltd.

(83-93, Farringdon Road, London, E.C. 1).

An outstanding feature of this display is a series of outdoor lamps of the "Warrington" type. Besides those of the familiar inverted type with either single or cluster burners, varieties equipped with special reflectors have been evolved. Special interest attaches to the three-tier 12-section directional reflectors in stainless steel, which are fitted to standard lanterns and to the "Warrington" outdoor flood lamp equipped with "Striplite" superheater to take ten bijou mantles, and with adjustable polished stainless steel reflector at back. Another unit of a somewhat unusual character is the high power gas lamp for flood-lighting the interior of showrooms, duplicate lamps with parabolic reflectors being mounted side by side.

Perhaps the most interesting feature of this exhibit, however, is the display of gas signs which have been marketed by the firm for the first time during the past few months. These signs are extremely simple in principle, they are substantially foolproof, and the cost of operating them may be regarded as negligible. There are two varieties of static sign manufactured—that with the burner above, reflecting the light downwards on to the wording of the plate glass, and that with an enclosed burner either end of the sign, reflecting the light laterally. Each of these types is illuminated by means of two bijou mantles, producing a very excellent effect.

The moving signs, which are specially interesting, are again divided into two main types—that with the wording to be reproduced out of a metal sheet immediately behind the front screen, and that with a plain opal screen and the wording stamped out of the revolving cylinder within.

Foster & Pullen, Ltd.

(Avil Works, Crossley Hall, Bradford).

This exhibit includes square lanterns fitted with both stainless steel reflectors and Holophane refractors; an

assortment of strip lanterns for advertising purposes, together with slatted reflectors for flood-lighting; a selection of U-type fittings and a varied series of burners for public lighting.

There are also on view semi-portable units for indoor displays for showroom and other purposes, and other standard lines of equipment with which the firm's name is associated.

Gas Meter Company, Ltd.

(238, Kingsland Road, London, E. 2).

The familiar " London " clock controller is prominently exhibited. Controllers are shown operating various makes of burners, including clusters. For advertising purposes the proprietors of many shops and showrooms wish to light their windows for some hours after closing, and do not wish the lights burning on certain day or days of the week. A special " London " with selective attachment is shown for this purpose, and can be supplied to light by hand and extinguish automatically if desired (the hand lighting being especially useful in case of fog), or wholly automatic.

In many industries much time is lost in early morning because operatives cannot commence work until their material is heated. This time can be saved by the " London " controller. For instance, they are at present in use in up-to-date establishments for the purpose of lighting and extinguishing gas fires for heating purposes, gas furnaces for pottery kilns, gas for hot water appliances, gas for shop windows, gas for illuminated signs, and for controlling the loading and unloading of governors by air or water. All the above-mentioned controllers can, if desired, be fitted with ½-in., ¾-in., or 1-in. cocks. The mechanism of the " London " controller being especially suitable for operating these large cocks, and having a second train of wheels, the time-keeping is not affected.

On this stand another efficient controller, the " Kingsland," is being shown.

The movement of the " London " is fitted with a double train, while that of the " Kingsland " has a single train.

Holophane, Ltd.

(Elverton Street, Vincent Square, London, S.W.).

Messrs. Holophane, Ltd., are showing a series of prismatic street lighting refractors. These are comprised of types giving various light distributions which are arranged to meet every contingency likely to arise in street lighting practice. They are divided into three main groups—bowl, dome, and band refractors, together with a large ornamental type.

The light control system is similar in each case, the prisms being arranged on the exterior of the inner member and the interior of the outer member. The two members are then sealed and clamped together, giving the unit a smooth interior and exterior surface which is easily kept clean, the actual optical system being fully protected from the weather. This avoids the necessity of enclosing the units in an outer globe.

Six different types of bowl refractors are available—the symmetric having a circular distribution and being suitable for open areas, squares, &c.; the asymmetric for positions along one side of a road where the spacing is relatively close or the road very wide; the two-way non-axial for staggered spacing along an average road between intersections; the three-way for " T " junctions, the four-way for normal crossings, and the two-way axial for central suspension between intersections.

The dome refractors are available for symmetric, asymmetric, and two-way non-axial distribution, the band type being limited to the symmetric and two-way non-axial.

The ornamental unit is supplied in two types for symmetric and asymmetric distribution.

Two main series of lanterns are available for use with the Holophane Prismatic Refractors—the cast iron and the spun copper type. Both are arranged with anti-vibration lampholder fixing and external lamp focussing device. A small tag is suspended by a chain inside the lantern, on which is indicated the lamp focus for various beam angles, so that the lamps can be very quickly adjusted to their correct position.

Horstmann Gear Company, Ltd.

(Newbridge Works, Bath).

This firm, the makers of " Newbridge " clockwork gas controllers and electric time-switches for public lighting, are exhibiting several recent patented devices. In regard to the gas controllers, the actual by-pass head used for ignition is of considerable interest. Known as the " Equinox " it consists of an all-metal heavily chromium-plated cup into which is riveted a jet of pure platinum. The latter material is, of course, absolutely immune from corrosion or carburization, while the head, being of all-metal construction, is immune from fracture even when tightly screwed to the pilot tube. Patents have been applied for, and already large numbers of these by-passes are in use giving excellent results.

On the other hand, those engineers to whom by-passes of any kind are anathema will find great interest in the " Newbridge " gas controllers with electro-catalytic ignition. Applied to the well-known Type 3A/UNI controller this form of ignition has been most rigorously tested by the makers over a period of nearly two years, and is offered with complete confidence. The system employs an electro-catalytic igniter consisting of a platinum alloy filament protected by a sheath of special design. At the same movement as the gas is turned on by the controller, this filament is preheated by a 3-volt battery. The gas is led to the filament by means of a neat scoop, and immediately it impinges on the filament the latter glows intensely and causes the gas to ignite. The battery circuit is automatically cut off after a 3-5 seconds pause; and tests made for battery life indicate that this is at least seven months.

A range of ironclad controllers for suspension and harp lamps is also on view.

James Keith & Blackman Company, Ltd.

(27, Farringdon Avenue, London, E.C. 4).

Examples are shown of several high-pressure gas lamps manufactured by this firm. These lamps are representative of the actual lamps used for street lighting in the City of London and Westminster districts, and a very large portion of South London. The following lamps are shown: One 1000 c.p. suspension lamp No. 807 " Squat " pattern, fitted with special directional reflector; one 1500 c.p. suspension lamp No. 805, fitted with special directional reflector; one 2-light 2000 c.p. suspension lamp fitted with 1932 pattern heaters (a smaller edition of the recognized centrally suspended City lamp); one 2-light 3000 c.p. standard pattern suspension lamp, No. 920, as used in the City of London and the West End. All these lamps are fitted with automatic lighters for distance control.

Fitted to columns carrying low-pressure gas lamps outside the Hydro samples of Keith patent raising and lowering, and raising and lowering and traversing, gears are on view. An example of the raising, lowering, and traversing gear is also shown on the stand.

C. H. Kempton & Co., Ltd.

(Stangate House, 235, Westminster Bridge Road, S.E.).

This exhibit includes, among other items, the " Majestic " circular lamp, central suspension with superheaters arranged for ten to twelve No. 2 mantles, approximate candle-power 1000; the " Kemborn " circular lamp, central suspension with superheater arranged for six staggered bijou or four No. 2 cluster, giving approximate candle-power of 380 to 400; highly polished stainless steel directional reflectors for use with the above units; a unit for general floodlighting purposes, with parabolic trough reflector, giving about 2000 c.p.; 1-light and cluster inverted burners for indoor lighting; and circular and square lanterns for street lighting.

Metropolitan Gas Meters, Ltd.

(Hyson Green, Nottingham).

This exhibit comprises a series of lamps operated by a number of " Duplex " controllers. The motive power operating this appliance is clockwork. The apparatus operates through two tappets set at predetermined times on a dial, actuating a rocking arm which is in communication by suitable means to a gas valve. The engagement of the tappets with the rocking arm opens and shuts off the gas to the burner, at the same time opening and shutting the by-pass intermittently with the gas supply. The gas valve can be hand-operated without interfering with the clock or setting. The valve is of the shuttle type (not a plug tap). The controller has a high grade clock, with fully jewelled escapement.

The " Duplex " controller is exceedingly simple in operation though it performs many functions. It is instantaneous in action and it can be set to operate once or twice in 24 hours at will (no parts to be removed or attached). It can also be set to light up at any time and to extinguish at any time after an interval of two hours; or to light up again at any time after an interval of a minimum of one hour and extinguish again any time after an interval of

two hours. The by-pass is extinguished during lighting hours.

Further advantages of the apparatus are:

It can be turned on by hand if desired without disturbing the normal sequence of operations.

It will work equally well in any position.

It is small (the height from the base of the socket to the burner nipple can be made as low as 2½ in.).

It has a large clear dial and can be set with accuracy.

Vibration of any description will not cause the mechanism to operate prematurely.

It is entirely enclosed in a perfectly dust and insect proof case.

W. Parkinson & Co.

(Bell Barn Road, Birmingham).

This exhibit comprises a fairly wide range of gas street lanterns, including square patterns with self-contained inverted burners, having outside gas and air adjustment, also fitted with the upright swan-neck type burner. These designs are shown with cluster and alignment burners.

There is also on view a variety of conversion burners with nozzles arranged in cluster and alignment formation. These burners are metalized, a treatment which prevents corrosion and moreover gives the articles a more attractive appearance. Some of the latest designs of suspension and "U" fixing lamps, which embody all the most modern improvements, including reflecting devices, are on view.

An important feature of the display is the demonstration of the "Mor-lite" patent directional reflector. This is a simple and inexpensive device which can be adapted to any burner. It is claimed that a 2-light medium burner with a polar curve averaging 150 c.p. will, when fitted with the "Mor-lite" give in the desired direction a value of 350 c.p. Furthermore, the increased illumination can be directed at the low angles of 10°-20°. The "Mor-lite" reflector comprises two highly polished "Staybrite" steel wings, which are secured to the burner by means of an attachment or clip. This enables the wings to be adjusted around both the horizontal and vertical axes, ensuring the maximum effect from the reflectors, the adjustment being variable according to the height and spacing of lamps and the curvature of the road. The wings can be instantly detached when required for cleaning lamp panes, &c., and replaced in the same position without disturbing the adjustment.

Considerable attention is being paid to the requirements of modern traffic conditions. "Danger" lamps with coloured globes for use with traffic island positions, and also a similar type of lamp fitted with a parabolic reflector for the illumination of traffic signs, are shown. One of the models exhibited is provided with a chromium-plated reflector having a ruby lens inserted, so that it serves the double purpose of illuminating the traffic sign, and also acting as a danger signal.

"Parkinson" lamps are also in operation outside the Imperial Hydro Hotel.

William Sugg & Co., Ltd.

(Ranelagh Works, Chapter Street, Westminster, S.W.).

This is a comprehensive exhibit and includes a representative series of the familiar types of lamps supplied by the firm. There are a 6-light upright "Rochester" lamp with "Multi-ray" reflector and controller in the base; an 8-light "Rochester" suspension lamp with dual supply (six and two lights) fitted with the "K" type rustless steel directional reflector, clock controller, and governor; a 6-light lamp of similar pattern, with chromium-plated police reflector and clock controller; a 4-light, with "Multi-ray" reflector; a similar lamp with four mantles in line and the "S" type directional reflector.

Other interesting exhibits for general purposes are the 3-light "Promenade" lamp, which, like the upright "Rochester," uses the bowl form of glassware, but is made on plainer and more economical lines, and the firm's 18-in. "Windsor" lamp, with four No. 2 mantles—probably the most popular of the square, glazed pane type of lamp.

Then, for special purposes, the flood lamp will be found of particular interest; while others in this category are the 1-light "Littleton" lamp with ruby globe for road crossings and danger spots; the 3-light "Littleton" suspension lamps with adjustable, chromium-plated, parabolic reflector to light important road signs; the No. 1548 back lamp for subways and other positions calling for wall fixing; and the "Holyhead" lamp, a bracket fixing model for porches, passage-ways, &c.

A comprehensive display is made also of conversion sets, the novel feature of many of them being that they include the "Multi-ray" reflector, thus permitting an old lamp to be converted from the obsolete upright or large size inverted mantle to the efficiency of the latest type of new lamp with superheated small mantles and reflector.

Examples of reflectors apart from the lamps include a special "Multi-ray" made in stainless steel with six facets each side; a stainless steel reflector for the 16-in. "Windsor" lamp with special directional wings; and several forms of the rustless steel directional reflector.

Miscellaneous items of interest include several governors of varying types and Sugg's patent distant control device, the working of which is made clear by means of actual sections. These section models, too, include a gland pattern control cock which is used largely and successfully in connection with the distant control device.

Association of Statutory Inspectors of Gas Meters

ANNUAL GENERAL MEETING IN EDINBURGH

The Annual General Meeting of the Association of Statutory Inspectors of Gas Meters was held in the City Chambers, Edinburgh, on Thursday, Sept. 1—Mr. H. N. Barrow, J.P., President of the Association, being in the Chair.

The delegates were welcomed to the City by Bailie Wilson M'Laren, Senior Bailie.

In the course of his remarks the Bailie mentioned that the first President of the Association was an Edinburgh man—the late Bailie Lyon, who was Chairman of the Committee which suggested the formation of the Association in 1914. Continuing, he said that the members of the Association had done splendid work in the advancement of its object.

One of its principal purposes was to ensure uniformity in testing conditions throughout Great Britain, and, in conjunction with the Standards Department of the Board of Trade, it was gradually and surely achieving its goal. All questions relative to the administration of the Sales of Gas Act were debated by the members of the Association, and the outcome of these deliberations was always beneficial to the members and to their respective local authorities. Nearly 10 million gas meters were in daily use throughout Great Britain.

It was recognized that the major portion of the revenue earned by all the local authorities and companies engaged in the sale of gas was governed by the registration and accuracy of the gas meter. They could, therefore, understand why the instruments were designated "The Chartered Accountants" of the Gas Industry.

They were at present being advised to use more coal for the purpose of increasing work in the mines, and no better method could be recommended than by the British public using gas to the greatest degree. By doing so the coal and its bye-products were utilized in a scientific manner. Consumers of gas were also participating in the crusade to purify the atmosphere in the large cities.

In thanking the Bailie for his welcome, the President referred to the progress in the Gas Industry, and emphasized the need for gas meters being taken out of use after ten years' work. The life of a meter, he said, owing to the changing conditions in the Industry, was considerably shorter than it once was. He instanced how in certain large cities it had been demonstrated that, out of 5000 meters over ten years old, not 10 p.ct. would pass the test.

The minutes of the previous annual general meeting were read and confirmed, no discussion arising out of the same.

In the absence of the Hon. Treasurer (Mr. J. L. Barry, L.C.C.) the Hon. Secretary read the financial report, and the statement of accounts was adopted.

Annual Report of the Council, 1932.

During the year under review, the Council held two meetings, one in Liverpool on Dec. 16, 1931, and the other in London on June 7, 1932; and of the subjects which were under consideration, two in particular occupied their close attention—namely,

(*a*) The question of the compulsory re-verification of gas meters, and

(*b*) The intepretation and application of the circular Number R.138, issued by the Board of Trade as a result of the

examination of a meter under Section 6 of the Weights and Measures Act, 1904.

PERIODICAL RE-VERIFICATION OF GAS METERS.

It will be remembered that at the Annual General Meeting last year, the prospect of a further joint conference between the Gas Industry and the Association was reported, and that delegates, representing both the Administrative Authorities and the Association, were appointed to meet the representatives of the Gas Industry in the event of the conference being called during the year.

At that meeting resolutions were also passed in favour of:

(*a*) Gas meters having to be re-verified every ten years, and
(*b*) Inviting the support of administrative authorities upon the general principle of periodical re-verification.

A memorandum, setting out the Association's case in support of periodical re-verification was prepared and submitted to the Gas Industry on March 23, 1932; the joint conference referred to above was held, at which representatives of the Gas Engineers and the Gas Meter Section of the Society of British Gas Industries were present.

The memorandum was not contested in any way by either organization, and on the part of the Institution of Gas Engineers, it was said that, as a purely technical and advisory body, they could agree with the Association on the general principle. On the other hand, the feeling in the Gas Industry was that, however desirable or necessary such a scheme may appear, any further restrictions upon or requirements relating to gas meters should be applied in like manner to electric meters. Your representatives who went with the single purpose of examining the issue with respect to gas meters, upon its merits, were, however, unable to resist sympathetic feeling towards this submission.

At the conclusion of the discussion, the following formula was submitted by the Gas Engineers and accepted as a definite step forward:

> " The Institution of Gas Engineers approves the principle of the re-verification of gas meters on the following basis, but is of opinion that the principle should not be applied until provision is made for the verification and re-verification of electricity meters:
>
> " The basis of the re-verification should be that all meters which have not been verified (or re-verified) for over twenty years shall be re-verified within five years, and all meters which have not been verified (or re-verified) for over fifteen years shall be re-verified within ten years of the date of regulations to this effect, and after such period of ten years all meters shall be re-verified within fifteen years of their last verification (or re-verification)."

It was understood that, the Institution being only the advisory body, the endorsement of the National Gas Council would be necessary for the formula to have any real force; up to the time of going to press, however, this endorsement has not been received. The Council, having pursued the matter to the present stage, awaits the views of the Association and such further instructions as may be deemed to be desirable.

BOARD OF TRADE NOTICE NO. R.138.

The general effect of Circular R.138 which was issued by the Board of Trade in October, 1931, has been most unfortunate in the interpretation and operation. Attempts by your Council to obtain uniform action on the lines indicated by the Board of Trade appear to have proved unsuccessful. Some Inspectors have held strong views on the procedure adopted by the Board of Trade, and as to what constituted their duty in the circumstances. The Board, however, have intimated their intention to make a regulation at an early date to deal with the pattern of meter in question. This will have the desired effect of enforcing uniform action and treatment.

VERIFICATION OF ELECTRIC METERS.

At the last Annual General Meeting of the Association the Council was requested to go into the question of the testing of electricity meters, and to report upon the matter at a subsequent meeting.

When communicating with administrative authorities upon the question of the periodic re-verification of gas meters, opportunity was taken to request the views of the same authorities upon the suggestion that statutory control should be applied to electricity meters similar to that applicable to gas meters.

REVISION OF GAS METER REGULATIONS, 1920.

In accordance with instructions received at the last Annual Meeting, the following submissions have been made to the Board of Trade for consideration when revising the existing regulations —namely,

(1) *Absorption of Pressure.*—That air be adopted as the standard for this test, subject to allowances in appropriate cases.
(2) *Stamps on Meters.*—That in the case of meters bearing more than one seal, where one or more seals are broken or defaced the meter shall be deemed an unstamped meter.
(3) *Indices.*—That the testing circle shall consist of two concentric circles, and the extremity of the index finger shall traverse the space between such circles—*i.e.*, projecting beyond the inner, but not reaching the outer, circle. The width of that part of the index finger projecting beyond the inner circle shall not be greater than that of the subdivision marks.

These suggestions have been acknowledged by the Board of Trade who have stated that, as regards

(1) The Association's suggestions are agreed to in principle, subject to any representations that may be made by the owners and meter makers.
(2) It is not clear whether the Association's suggestion would not involve an amendment of the law, but will be borne in mind.
(3) The points raised will receive consideration in connection with the revision of the regulations.

The meeting adopted the Annual Report of the Council and proceeded to consider it in detail.

PERIODICAL RE-VERIFICATION OF GAS METERS.

The subject of the periodical re-verification of gas meters raised considerable discussion.

Mr. SLOAN (Coventry) asked whether or not it would be advisable to extend the scope of the investigation by getting into touch with local authorities other than administrative authorities who have already been communicated with.

Mr. GULLAND (Edinburgh) considered the suggestion for a period of ten years too restrictive, and wished to know the grounds upon which the suggestion was based. He considered fifteen years far more suitable and practical, and that all meters were not alike.

Mr. GORDON (Edinburgh) said the main thing was to get the principle established, and in his opinion the basis suggested by the Committee of the Institution of Gas Engineers was undoubtedly reasonable and practical.

The PRESIDENT said that any testing done *in situ* would not have the effect of conferring legal status, and that ten years was absolutely the maximum period that should be allowed, and that he and his Committee would do their utmost to bring this about.

Mr. HUME (City of London) said that the primary concern of the Inspectors was the consumer, and the majority of incorrect meters were against the Gas Industry, which was quite capable of looking after its own interests. No commodity was more protected at the present time than the sale of gas.

Mr. WATSON (Sheffield) considered that on this question a matter of primary importance had been lost sight of—that of the power of entry into premises as and when occasion demanded it.

The SECRETARY assured him that this item had received attention, and was on the file.

Mr. TEMPLETON (Leeds) suggested that the tendency of the discussion to fasten upon the ten years' period appeared to be obscuring the real aim and concern of Inspectors—viz., to secure the principle of a limited period during which a meter should remain a legal measure, and that the question of period was quite a secondary matter which could safely be left to the Board of Trade finally to determine. In his opinion the Association would be well advised to support the formula put forward by the Institution of Gas Engineers, the terms of which were most reasonable. It would be patent to all that some qualifying period was essential to bring such a scheme into operation.

Mr. CHAMBERS (Birmingham) said that, as a Vice-President of the Association, he had listened with interest to the discussion, but would venture to suggest it was not leading anywhere, and was in fact a reiteration of previous expression. Provided the terms laid down in the report had the approval of the meeting, he would recommend their acceptance.

Mr. LANGLANDS (Glasgow) moved, seconded by Mr. TEMPLETON, that as a basis of further negotiation, the terms set out in the report be approved. The motion was carried.

In connection with R.138 and " Hotel Meters," Mr. R. J. TRUMP (the Controller of the Standards Department) explained the position of the Board of Trade, and said that when a pattern was submitted for certificate, the Board had to consider whether or not the particular pattern of meter was such as to facilitate fraud. In the pattern submitted they found that it did, and in consequence there was no option but to refuse a certificate. It was unfortunate that confusion of action had arisen among Inspectors, and it had been hoped that, through the agency of the Association, uniformity of action would have been secured. The position was not rendered easier by the fact that the Department were not in a position to interpret the law, which remained the duty and responsibility of the individual Inspector in conjunction with his authority. The Board had a regulation in draft form to cover this particular pattern of meter, but difficulties were being experienced in setting-up a precise draft which, while covering the object aimed at, would not affect issues that were not intended.

The remainder of the report was approved *nem. con.*

ELECTION OF OFFICERS.

President.—Councillor J. W. Willoughby, M.B.E., J.P., Salford.

Vice-Presidents.—Mr. H. N. Barrow, J.P., Manchester; Mr. C. Chambers, J.P., Birmingham; Bailie McKechnie, Edinburgh; Bailie P. Given, Edinburgh;

Bailie Macwhunnell, Glasgow; Councillor Furber, Coventry; Councillor F. T. Baker, Nottingham; Mr. H. J. C. Davies, Chief Officer, Public Control Department, L.C.C.

Hon. Secretary.—Wm. Templeton, Leeds.

Hon. Treasurer.—J. L. Barry, L.C.C.

Council.—Messrs. W. Gordon, Edinburgh (Chairman); G. Hume, City of London (Vice-Chairman); J. E. Sloan, Coventry; G. F. J. Knott, L.C.C.; A. Winterbottom, Manchester; E. M. Foster, Exeter; F. Colburn, Birmingham.

Auditors.—Messrs. F. A. Rolfe, L.C.C., and E. Simpson, Salford.

Mr. WILLOUGHBY, expressing his thanks to the Association for honouring him with the Presidency during the coming year, said that for a number of years now he had taken a great interest in the work of the Association, and that it was largely due to the retiring President that he had been induced to take that interest. The Association could rest assured that he would do all in his power to further its objects.

It was decided that the next annual general meeting should be held in London.

Mr. SLOAN, who in addition to being a member of the Council is also Secretary of the Incorporated Society of Weights and Measures, said that in view of the presence of Mr. Trump, who had recently been promoted to Controller of the Standards Department, he would like to move that the congratulations of the Association be extended to Mr. Trump upon his appointment. Mr. Sloan referred to the fact that the appointment had secured a continuation of policy and the considerate assistance always extended by Mr. Trump, and was pleased to think they could look forward to a continuance of his goodwill.

Mr. TEMPLETON—as Secretary of the Association—in seconding the motion, cordially supported and associated himself with Mr. Sloan's remarks.

Mr. TRUMP, making suitable response, paid tribute to the good work done by the Association, and said that it was a pleasure to attend the meetings when possible and to get into personal contact, which often assisted them at headquarters.

ADMINISTERING THE SALES OF GAS ACT, 1859, AND THE GAS METER REGULATIONS, 1920, AS APPLIED IN EDINBURGH.

By WILLIAM GORDON, of Edinburgh.

It may be of interest to go back to the early days of the distribution of coal gas, when the only method of estimating the quantity consumed was by the haphazard one of computation. This system necessitated charging the consumer a rent for a certain number of burners, on the supposition that they consumed a given quantity of gas per hour and were used daily for a stipulated number of hours.

This method of charging led to many abuses, which compelled the suppliers of gas to charge a price which would indemnify them, and the honest consumer had not only to pay for his consumption of gas, but had also to contribute towards that of his dishonest neighbour.

The cubic foot had been adopted by the sellers of gas as the unit of measurement; but no official certification of its exactness could be obtained.

EARLY DAYS OF THE GAS METER.

To those concerned in the progress and development of gas, it soon became evident that, if some instrument could be devised by which the new illuminant could be sold by measure, instead of by computation, its use would be greatly extended.

About this time (1814), several instruments were invented, attempting accurate registration, but the majority were too complicated to be commercially successful.

The gas meter, however, continued, in the face of much opposition, to make progress, and about the year 1857 there were a considerable number of meters—wet and dry—in use. Repeated and bitter controversies continued to arise as to their accuracy; and one instance is mentioned where a manufacturer is reported to have stated "that his meters were much better than his rivals', because they were constructed to register more than double the quantity of gas consumed."

THE SALES OF GAS ACT.

Complaints continued and became so frequent as to endanger the large pecuniary interests involved; and the numerous companies, with a view to promoting justice and ensuring exactness of registration in gas meters, welcomed the introduction into Parliament of the Sales of Gas Act. The Act met with practically no opposition, and received the Royal Assent on Aug. 13, 1859. Experience in carrying out the Act led to the introduction of several amendments, which were added in 1860 and 1864.

THE CUBIC FOOT BOTTLE.

The Legislation had decided to adopt the cubic foot as the unit of measurement. The duty of constructing this standard measure was no easy one.

A definite volume or bulk—a cubic foot—of an aeriform nature had to be obtained with the utmost accuracy. The substance to be dealt with is invisible, highly elastic, varying in bulk with every change in atmospheric pressure or temperature, is possessed of a very complex chemical constitution, and is liable to being partially absorbed by water.

No expense was spared on the work, and the successful construction of this instrument established, for the first time, the official *unit* of gas measurement.

The completed measure is a copper vessel or bottle, in shape a cylinder of 12 in. external diameter, with a cone at each end. The cylinder is strengthened with a brass belt at the top and bottom. The instrument is constructed to contain 62·321 lbs. weight of distilled water; this being the legal weight of a cubic foot of water at the temperature of 62° Fahr., the barometer being 30 in. The weight of the bottle slightly exceeds 25 lbs.

STANDARD TEST HOLDERS.

The next step in the measurement of gas was the procuring of standard gasholders, to serve the double purpose of holding, and registering with exactness, one charge or several charges of the cubic foot bottle, and designed so that their contents could be discharged into the gas meter which was being officially tested. Standards of a capacity of one, five, and ten cubic feet were constructed. A few of the principal features in the specification of these handsome instruments may be mentioned.

(1) That the cylinders should be composed of an anti-corrosive metal capable of resisting the chemical action of the constituents of coal gas and water.

(2) That the surface of the bell (or cylinder) should readily part with the water with which it comes in contact during the testing operations.

(3) That the bell should be correctly balanced, and that a part of the counterpoise, suspended by a cord passing over a spiral, should preserve the equipoise of the bell at the various depths of its immersion in the water contained in the tank.

STANDARDS DEPOSITED IN EDINBURGH.

Copies of the One, Five, and Ten Cubic Feet Standards, also of the original Cubic Foot Bottle, are now deposited in the City Chambers, Edinburgh.

The Magistrates, as custodians, value the Standard Models so highly—there are only three sets in Great Britain—that an insurance policy for a large sum has been effected upon them.

The knowledge that reliable instruments had been constructed, which definitely allowed Official Inspectors to decide the vexed question of accurate measurement, gave an impetus to the Gas Industry and disarmed, to a great extent, the adverse criticism which had been directed towards the gas meter. It also gave greater confidence to the buyers of gas, and, consequently, the meter became more acceptable as a measuring instrument.

In Edinburgh the first gas meter was officially tested, found correct, and stamped on Sept. 16, 1861.

During the first twelve months 37,605 meters were examined, and it may be assumed that a considerable proportion of these meters would probably be submitted for verification, to meet the requirements of the new Act.

During the years 1861 and 1891, of the meters examined by this Department, the wet type was considerably in the majority. From the year 1892, however, the use of dry meters greatly increased, and at the present time the proportion of meters submitted for examination is, approximately, 120 dry meters to one wet meter.

GAS REGULATION ACT, 1920.

For many years the Sales of Gas Act, 1859, had met the requirements of the seller and the consumer of gas, but new methods had been gradually introduced into the distribution of coal gas. The installation of gas engines, fires, cookers, and the greatly increased use of gas for commercial heating purposes necessitated higher pressures in the mains, and it became evident to those interested that the 1859 Act would require to be amended so as to meet the new conditions.

In view of the representations made by interested representative bodies, among whom were delegates from the Statutory Inspectors of Gas Meters, the Board of Trade, in 1920, issued "The Gas Meter Regulations," under Section 12 of the Gas Regulation Act.

The Regulations are of great value to Inspectors, and

have assisted to ensure uniformity in testing procedure throughout the country.

The Regulations also prescribe that the Board of Trade provide for the holding of examinations to ascertain if applicants for the post of Inspectors of Gas Meters possess sufficient practical knowledge for the proper performance of the duties of that post, and for the grant of certificates to persons who satisfactorily pass such examination. And, also, that a person shall not, after the passing of the Act, be appointed to act as an Inspector of Meters, unless he has obtained such certificate.

District Testing Station.

The principle of having Testing Stations in Edinburgh has been in vogue since the Department was established. This method may have its disadvantages—viz., extra cost of service and also greater difficulties in supervision—than if all the testing equipment were installed in a Central Office, but it has been found from experience that the system is of great assistance to the manufacturers, as it obviates the necessity of having delicate measuring instruments being conveyed through the streets of a large city, in climatic conditions varying from zero to summer heat, before and after verification.

Up to the year 1919, there were five Testing Stations. On the amalgamation of Edinburgh and Leith other two stations were incorporated.

In 1921, upwards of £800 was expended by this Department in installing equipment to meet requirements, as prescribed by the Gas Meter Regulations, 1920.

During October, 1922, a new station was opened, and testing apparatus, costing upwards of £300, was installed.

The District Stations, although in close proximity to the respective manufacturer's premises, are entirely under our own supervision, and access can be obtained at any time. Stipulated rents are paid for these stations, and the cost of maintenance and cleaning is borne by the Department. All the stations are in telephonic communication with the Head Office, City Chambers.

The Staff employed, as at May 15 last, was one Chief Inspector and seven Inspectors. Temporary assistance is engaged as required.

We have, at present, seven Testing Stations under the jurisdiction of the Right Hon. The Lord Provost and Magistrates, who are the Local Authority for the Administration of the Sales of Gas Acts.

Instruments in Daily Use.

The Department is one of the largest of its kind in Great Britain. We have in daily use sixteen 5 c.ft. and six 10 c.ft. test gasholders. These instruments are practically identical in construction with the Standard Models, but are not so expensively fitted.

The estimated value of the total testing equipment (not including the Standards) is upwards of £3500.

The test holders are periodically re-verified by Officials from the Standards Department of the Board of Trade.

Total Meters Tested since 1861.

The following table shows the number of meters tested, and fees earned, since the institution of the Department:

Period.	Dry Meters.	Wet Meters.	Total Meters.	Fees.
				£ s. d.
1861–1926 .	2,468,005	1,127,934	3,595,939	115,419 13 9
1926–1927 .	95,251	844	96,095	5,343 5 0
1927–1928 .	92,086	789	92,875	5,179 1 0
1928–1929 .	70,682	634	71,316	4,045 7 0
1929–1930 .	69,674	612	70,286	3,981 14 0
1930–1931 .	57,604	434	58,038	3,276 14 3
1931–1932 .	57,146	474	57,620	3,274 8 9
..	2,910,448	1,131,721	4,042,169	£140,520 3 9

In May, 1907, the number of prepayment meters were classified, and since that date until May 15 last, 768,514 automatic meters (new) and 346,662 (repaired) have been examined and verified.

After verification, the particulars of each meter are entered in a special register, and I should mention that, in the case of a dry meter, eight, and in a wet meter, nine, separate entries require to be made by the Inspector. These registers are, on occasion, used for the purpose of reference regarding tests, after a lapse of many years. In Edinburgh we can trace the original tests of every meter examined since 1861.

Multiplicity of Sizes.

In connection with this subject I consider, with the general desire for economy, this would be an opportune time for manufacturers of meters and those interested in the distribution of coal gas to co-operate with a view to suggesting improvements which would be helpful.

To cite one instance, Inspectors are at present having submitted to them different kinds of gas meters which, though of the same outward dimensions, have different badge designations regarding capacities and revs. per hour for each instrument—viz., (1) A 2-light meter is the same size of case as a No. 1 Standard meter, also the same as a 50 c.ft. high-capacity meter. (2) A 3-light meter is the same exterior size as a No. 2 Standard meter, also the same size as an 80 or 100 c.ft. high-capacity meter, and so on throughout a large range of meters.

It may, therefore, be suggested that if those interested concentrated on the question of providing a meter of a particular size and denomination, with a standardized capacity (instead of three meters), it would obviate the carrying of large stocks of the component parts required, under the present conditions, for repairs and replacements; a somewhat confusing state of affairs would be eliminated, and the results obtained would be beneficial to all concerned.

Meters Rejected as Incorrect.

When submitted for verification the meters are subjected to all the tests, as prescribed by the Act, but the number rejected is now exceedingly small. During the past twelve months the number of incorrect new meters was: Dry 2 p.ct.; wet 2·53 p.ct. These figures appear to indicate that the makers are cognisant of the somewhat severe examination which the instruments have to undergo prior to being stamped as correct, and also suggest that this knowledge keeps their methods of assembling, checking, and proving up to a very high standard; and, of course, there is also the monetary side of the question, as a rejected meter has to be paid for again each time it is submitted for verification.

In a Department of this kind, which fulfils a public necessity, it is not anticipated that a profit be shown, but since the inauguration of the Sales of Gas Act the Department has been entirely self supporting. For many years it has produced a profit, and all expenditure has been paid out of revenue.

Notwithstanding the general economic conditions in trade, we have, during the past five years, been able to contribute a sum amounting to upwards of £6000 to the city's exchequer.

A Centre of Gas Meter Industry.

Edinburgh has, for upwards of a century, been recognized as one of the principal centres of the gas meter industry in Great Britain. The years of experience gained in constructing all kinds of gas measuring instruments have enabled local manufacturers to obtain a considerable proportion of home trade, and that of our Colonies and other countries throughout the world. The work is of a highly technical nature, and great skill is required to devise and produce the finished article.

The number of employees engaged in the various local factories, in normal times, amounts to upwards of 1000, and the rateable value of the establishments is about £3000. The approximate quantity of gas consumed per annum is 18 million c.ft., costing about £2000—more than is consumed in some small towns. The amount of electricity used is about 135,000 units.

From the above figures it will be inferred that the business of gas meter making is an industry of importance in the City of Edinburgh, not only as an asset to the commercial trading departments, but as employers of a large number of ratepayers.

The Department is to-day in a high state of efficiency, and I am hopeful that the local manufacturers will continue to maintain their prestige. Should they do so, this Department can be depended upon at all times to make the necessary arrangements to meet their requirements.

Those responsible for the Administration of the Sales of Gas Acts can be assured that when these Acts are thoroughly carried out, no commodity supplied to the British public is measured with greater accuracy than coal gas.

Vote of Thanks.

Mr. Foster, moving a vote of thanks to Mr. Gordon, remarked that, while he thought the paper did not lend itself to discussion, he was interested to note that in Exeter, being district No. 11, the first meter was stamped on Sept. 11, 1861, and that Exeter could therefore claim to have run a parallel course with Edinburgh.

Mr. Hill seconded, and Mr. Gordon replied.

Luncheon.

The Lord Provost presided at a luncheon to the delegates held in the City Chambers.

The Lord Provost said he understood that the Association was founded in 1914, and that its objects were to promote uniformity of procedure, to provide the vehicle of interchange of knowledge and experience, to provide a central organization to act as a liaison agent between Inspectors and the Board of Trade, and to provide facilities

whereby the development in design and construction of gas meters could be watched with a view to formulating and submitting to the Board of Trade suggested amendments to the regulations as experience would indicate to be desirable.

The statutory control of gas meters, primarily instituted to protect the interests of consumers, might fairly claim to have developed to a service that held the balance between (1) the gas meter manufacturer, (2) the Gas Industry, and (3) the consumer, as follows:

The meter manufacturer was protected by the knowledge that before the meter was stamped for use it had to undergo a rigorous examination at the testing station, passing which the meter could reasonably be expected to serve through and beyond the period of guarantee.

The testing service guarded the interests of the Gas Industry by ensuring that the meter manufacturer supplied meters which were not subject to passing small volumes of gas without registration.

The consumer was protected against being mulcted by excess registration. Even the permissible error was loaded in favour of the consumer, being 3 p.ct. slow in favour of the consumer and 2 p.ct. fast in favour of the gas undertaking.

The founding of the Association had given rise to a Board of Trade examination of qualification before appointment as Inspector of Gas Meters, tending to improve the general standard of Inspectors, and the necessity for a central organization of such officials to govern the procedure in the testing and stamping of meters must be recognized.

Mr. H. N. BARROW, in reply, said that Edinburgh was famous for many things, including the manufacture of gas meters. The greatest curse of large cities was the domestic fire. They were gradually extending the use of gas and electricity to combat this, so that the output of gas was entirely different from what it was twenty years ago. The great object he had before him as President, was to see an alteration in the regulations. The law said that once a meter bore a Government stamp it could be out for ever. They contended that when a meter had been out for ten years it ought to be called in for re-verification.

Mr. C. CHAMBERS, Birmingham, proposed a vote of thanks to the Lord Provost.

VISIT TO WORKS OF MESSRS. ALDER & MACKAY.

On Friday, Sept. 2, the delegates paid a visit to the New Grange Works of Messrs. Alder & Mackay, Ltd., and were welcomed by members of the Board and Management—Mr. J. Miller Thompson, W.S., the Chairman of the Company, being present.

Mr. MILLER THOMPSON made reference to the fact that Councillor Fergus Harris, the Convener of the Edinburgh Gas Department, and Mr. H. H. Gracie, the Chief Engineer and Manager, had been good enough to join the party. The members were invited to ask questions on any feature of particular interest to them during their inspection of the works. The Company were very glad of this opportunity to meet the Inspectors at whose hands the final tests of gas meters take place.

Mr. Gordon, the Chief Inspector for the City of Edinburgh, first took the visitors over the No. 1 Station of the City Testing Department adjacent to the works, where some 40,000 meters are dealt with annually.

Continuing in the works, the visitors were shown a Standard Testing Set of the very latest equipment which had been temporarily erected by the Company for their benefit. This consisted of 10 c.ft. and 5 c.ft. Standard Test Holders complete with bubble leak indicators and coupled to adjustable orifice absorption gauges, King's gauges, &c., a 20-light Standard Wet Test Meter, and the very sensitive leakage meters which give a reading of $\frac{1}{10}$ c.ft. per revolution, divided into hundredth and thousandth parts of a cubic foot.

Mr. Gray, the Works Manager, demonstrated the method of checking the scales of the Standard Test Holders from the Company's cubic foot bottle, which bears the seal of the Standards Department of the Board of Trade.

The visitors heard with great interest of the Company's recent contract for the supply of a complete metric reading testing set for a South American Gas Company.

The visitors were then conducted round the factory in two parties, starting with the stamping machines and heavy power presses, which turn out and set up parts for the various sizes and types of dry meters. Some of these machines have an output of 7000 pieces per day. The course of these parts was followed through the relative stores to the top flat where case-making and the first assembly operations are started. The assembly of the meters was followed right through the various processes to the paint shop, where they are enamelled under pressure spray.

The factory, which is on the departmental system, is mainly lighted by high-pressure Keith gas lights. The soldering bolts are heated by gas and compressed air, and the annual gas consumption is some 7 million c.ft.

By Appointment
Ironfounders to H.M. The King.

For Service
and
Satisfaction

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GAS FIRES

THE FIRES PAR EXCELLENCE

Write for Catalogue No. 6M

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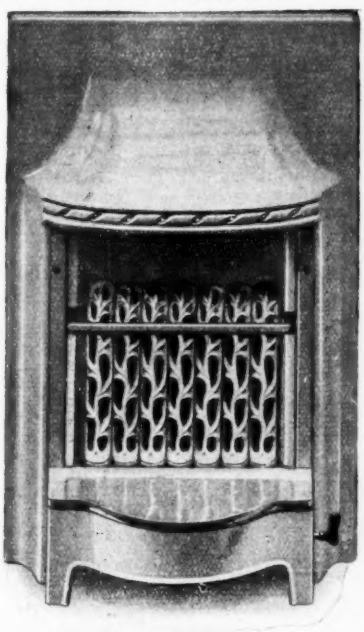

No. 501 Gas Fire

CARRON COMPANY · INCORPORATED BY ROYAL CHARTER 1773 · ESTO PERPETUA · FOUNDED 1759

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The Stock Exchange last week produced more points of interest than for some time past. Renewed strength in many commodity prices was responsible for greater activity in the Miscellaneous markets, and it is satisfactory to note that British Funds, which have been rather under a cloud during the past few weeks, commenced to regain their former popularity, and some appreciable improvements in value were recorded. This latter movement was undoubtedly assisted by the official announcement respecting the repayment on Dec. 1 of the 4½ p.ct. War Loan, 1925-45, and of the 4½ p.ct. Treasury Bonds, 1932-34.

The volume of business in the Gas Market was rather smaller than usual, but with few exceptions prices remained firm. European stock was in demand, and supplies being short the price advanced a further 5 points to 115, which, at the time of writing, includes the interim dividend of 5 p.ct. per annum free of tax. Bournemouth 7 p.ct. at 139 recovered 2 points of last week's *ex* div. marking, and Bombay £1 shares hardened 1s. 3d. to 18s. 9d., while (at the local Exchanges) Liverpool ordinary and Newcastle 4 p.ct. preference showed small improvements. The market was not without its reverses however, and among these were falls of 3 points in Gas Light 3½ p.ct. maximum to 79½ and Newcastle 3½ p.ct. debenture to 85.

A further addition has been made to the Stock and Share List by the inclusion of the British Gas Light Company, Limited, 5½ p.ct. preference stock, the first quotation on the London Exchange being 109½.

(Correction from Stock Exchange Official List: In the Stock and Share List published in the "GAS JOURNAL" on Aug. 24, the business done in the South Suburban Gas Company's 5 p.ct. debenture at 112 should have been marked to the 5 p.ct. preference.)

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Sept.* 5.

The prices of tar products for the current week are as follows:

Pitch is 95s. to 97s. 6d. per ton f.o.b.

Creosote is 3½d. to 5d. per gallon f.o.b., according to specification.

Refined tar is 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 5d.; pure benzole, about 1s. 8d.; 95/160 solvent naphtha 1s. 4½d. to 1s. 5d.; and 90/140 pyridine bases, 3s. 9d. to 4s.—all per gallon naked at makers' works.

Tar and Tar Products in the Provinces.

Sept. 5.

The average prices of gas-works products during the week were: Gas-works tar, 34s. 6d. to 39s. 6d. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 3d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 3d.; low gravity, 1¼d.; Scotland, 2½d. to 3d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 7½d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Sept.* 3.

On the whole market conditions are not too satisfactory, there being little movement in any product with stocks gradually accumulating.

Crude gas-works tar.—Actual value is lower at 50s. to 52s. 6d. per ton *ex* works.

Pitch.—Most distillers have little or nothing to sell meantime. Values are steady at 85s. to 90s. per ton f.o.b. Glasgow for export, and 90s. to 100s. per ton *ex* works for home trade.

Refined tar to Ministry of Transport specification is quiet, but quotations are unchanged at 4¼d. to 4½d. per gallon f.o.r. in buyers' packages.

Creosote oil.—Prices are well held and demand is moderate. B.E.S.A. Specification is 3¼d. to 3⅜d. per gallon; low gravity, 3⅜d. to 4d. per gallon; and neutral oil, 3⅜d. to 4d. per gallon; all *ex* works in bulk.

Cresylic acid.—While there are more inquiries orders remain scarce and prices are weak. Pale, 97/99 p.ct., is 1s. to 1s. 1d. per gallon; dark, 97/99 p.ct., 11d. to 1s. per gallon; and pale, 99/100 p.ct., 1s. 2d. to 1s. 3d. per gallon—all f.o.r. in buyers' packages.

Solvent naphtha is without interest at 1s. 2d. to 1s. 3d. per gallon for 90/160 grade, and 11d. to 1s. per gallon for 90/190 grade.

Crude naphtha.—Value is unchanged at 4½d. to 5d. per gallon, according to quality.

Motor benzole.—Stocks are low, but demand is poor. Quotations are from 1s. 2½d. to 1s. 3½d. per gallon in bulk *ex* works.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade, 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	0 8½	to	0 9	per gallon at works
Motor ,, ...	1 3½	,,	1 4	,, ,, ,,
Pure ,, ...	1 7	,,	1 8	,, ,, ,,

Contracts Advertised To-Day.

Compressor and Condensing Plant.

The Manchester Corporation Gas Committee invite tenders for the construction and erection of a gas compressor and condensing plant. [Advert. on p. 527.]

Trade Notes.

Harper & Moores Firebrick Company, Ltd.

The above-named Company has been formed to acquire and carry on the old-established firebrick business of Harper & Moores, Ltd., Stourbridge. The Colliery Undertaking belonging to the latter Company has been disposed of. The firebrick portion of the business will be continued under the title of Harper & Moores Firebrick Company, Ltd., and the services of the late Managing Director, Mr. V. R. Westcott, have been retained. The financial position of the new Company has also been greatly strengthened, as advantage has been taken to extinguish the whole of the debentures. The capacity of the Company for efficient production and its technical equipment have been improved.

Morris-Commercial Vans.

The motor vehicle plays an important part in the immense Post Office services, not only for the actual distribution of post bags but also for the maintenance of the thousands of miles of telegraph wires throughout the country. A big proportion of the vehicles used by the G.P.O. are 100 p.ct. British, and built in Birmingham at the Morris-Commercial Works. No fewer than 1600 vehicles have already been supplied, and of this total some thirty-three are doing good service in coping with the daily postal work of Birmingham itself.

Portable Pipe Screwing Machines.

A leaflet recently published by the "Spiro" Ball Bearing Co., Ltd., of "Spiro" Works, Regent Street, Kettering, describes their patent portable pipe screwing machines, which have been designed to save power, weight, and also to give a higher quality to the finished product. All threads are milled by a circular cutter, which ensures that all rough, torn, and crossed threads are eliminated. The machines will economically screw long and short lengths of pipe, in addition to running joints and nipples.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier pages.]

Issue	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Sept. 2.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Apl. 4	7⅞	7⅞	Alliance & Dublin Ord. ...	100—110	...	106½
374,000	,,	July 4	4	4	Do. 4 p.c. Deb. ...	80—90	...	...
557,655	,,	Aug. 22	7	7	Barnet Ord. 7 p.c.	132—142*	...	...
300,000	1	Apl. 29	1/4⅛	1/9⅜	Bombay, Ltd.	⅞—1 1/16	+1/3	20/-—20/3
177,750	Stk.	Aug. 22	9	9½	Bournemouth sliding scale	177—187*	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	134—144*	+2	140
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	128—133*	...	...
50,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	90—95	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
					Brighton, Hove, & Worthing			
357,900	,,	Aug. 22	7½	7½	6 p.c. Con. ...	135—145*	...	144
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	120—130*	...	129—130
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	127—132*	...	...
1,287,500	,,	Aug. 8	5	5	Bristol 5 p.c. max.	107—109a	...	...
120,420	,,	June 20	4	4	Do. 1st 4 p.c. Deb. ...	92—94a	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	90—94a	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	115—120a	...	...
855,000	,,	Apl. 4	7	8	British Ord.	130—140	−2	133—136
100,000	,,	June 20	7	7	Do. 7 p.c. Pref.	120—130	...	...
350,000	,,	—	—	—	Do. 5½ p.c. Pref. ...	107—112	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	87—92	...	90—92
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	,,	July 4	5	5	Cambridge 5 p.c. Deb. ...	114—119	...	...
100,000	10	May 23	6	6	Cape Town, Ltd.	7½—8½	...	...
100,000	10	Apl. 29	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	June 20	4½	4½	Do. 4½ p.c. Deb. ...	87—92	...	90⅝
626,860	,,	Aug. 8	6	6	Cardiff Con. Ord.	98—103	...	...
237,860	,,	July 4	2⅝	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	,,	Aug. 8	6½	5	Chester 5 p.c. Ord. ...	89—94b	...	...
98,986	1	May 23	2/-	2/-	Colombo, Ltd. Ord.... ...	26/—31/-	...	...
24,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	18/—20/-	...	...
609,204	1	Apl. 4	-/10'90	-/11'47	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,053	1	,,	1/2'54	1/3'30	Do. 8 p.c. Pref.	10/—15/-	...	...
2,073,280	Stk.	Aug. 8	5⅜	5	Commercial Ord.	102—107	...	104
475,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	71
807,560	,,	Aug. 8	7	7	Croydon sliding scale ...	130—140	...	133
469,590	,,	,,	5	5	Do. max. div.	95—100	...	97
500,000	,,	July 4	5	5	Do. 5 p.c. Deb.	115—120	...	...
642,270	,,	Aug. 8	10	7	Derby Con.	120—130c	...	...
55,000	,,	July 4	4	4	Do. 4 p.c. Deb.	75—85c	...	...
209,000	,,	Mar. 14	5	5	East Hull Ord. 5 p.c. ...	95—100	...	...
179,500	,,	Aug. 22	5⅞	6	East Surrey Ord. 5 p.c. ...	108—118*	...	...
155,019	,,	June 20	5	5	Do. 5 p.c. Deb.	114—119	...	...
1,002,180	,,	Mar. 14	†4	†6½	European, Ltd.	110—120	+5	113—118
19,405,992	,,	Aug. 8	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	22/—24/-g	...	22/1½—22/9
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.... ...	77—82	−3	79½—82
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	95—100	...	97—98½
6,102,497	,,	June 20	3	3	Do. 3 p.c. Con. Deb. ...	75—80	...	76
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	108—113	...	111¼
2,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	105—110	...	106½—107¾
264,011	,,	Aug. 22	—	6	Harrogate New Cons. ...	104—109*	...	...
82,500	,,	Aug. 22	7	7	Hastings & St. L. 5 p.c. Conv.	118—128*	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	88—93†	...	...
70,000	10	June 6	†5	†10	Hongkong & China, Ltd. ...	10—11	...	...
213,200	Stk.	Aug. 22	6	6	Hornsey Con. 3½ p.c. ...	103—108*	...	...
5,600,000	,,	June 6	15	14	Imperial Continental Cap.	185—195	−2	188—194½
223,130	,,	Aug. 8	3½	3½	Do. 3½ p.c. Red. Deb.	81—86	...	...
235,242	,,	Aug. 8	8⅜	8⅜	Lea Bridge 5 p.c. Ord. ...	142—152	...	...
2,145,907	,,	Aug. 22	6	6	Liverpool 5 p.c. Ord. ...	111½—113½b	+1½	...
245,500	,,	June 20	5	5	Do. 5 p.c. Red. Pref. ...	100—110b	...	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	85½—90½b	...	...
165,736	,,	Feb. 15	8	10	Maidstone 5 p.c. Cap. ...	155—165	...	160½—160¾
56,176	,,	June 20	3	3	Do. 3 p.c. Deb. ...	65—70	...	...
75,000	5	June 20	†10	†10	Malta & Mediterranean ...	7⅛—8⅛	...	8⅛—8¼
					Metropolitan (of Melbourne)			
392,000	—	Apl. 1	5½	5½	5½ p.c. Red. Deb.	95—100	...	...
171,978	Stk.	Feb. 29	5	5	M. S. D. Utility "C." Cons.	88—93	...	92
718,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	82—87	...	...
112,126	,,	July 4	4	4	Do. 4 p.c. Deb. ...	87—92	...	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...	...
675,000	,,	21 May '31	†6	†6	Montevideo, Ltd.	40—60	...	...
2,061,315	,,	Aug. 8	5¼	5	Newcastle & Gateshead Con.	20/—21/-d/	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	90—91d	+½	...
691,705	,,	June 20	3½	3½	Do. 3½ p.c. Deb. ...	84—86d	−3	...
277,285	,,	Apl. 29	5	5	Do. 5 p.c. Deb. '43 ..	105—110d	...	...
274,000	,,	Aug. 8	5	5	Newport (Mon.) 5 p.c. max.	85—87a	...	...
199,940	,,	Aug. 22	7½	7½	North Middlesex 6 p.c. Con.	135—145*	...	...
396,160	,,	Aug. 8	5	5	Northampton 5 p.c. max. ...	88—93	...	...
300,000	,,	Apl. 18	9	7	Oriental, Ltd.	85—95	...	...
205,162	,,	June 20	8	8	Plym'th & Stonehouse 5 p.c.	140—150	...	...
504,416	,,	Aug. 22	8	8	Portsm'th Con. Stk. 4 p.c. Std.	137—147*	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	88—93*	...	...
114,000	,,	Aug. 8	5	5	Preston 5 p.c. Pref.	100—105	...	...
686,313	,,	July 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	75—80	...	...
969,813	,,	June 20	4	4	Do. 4 p.c. Cons. Deb.	76—81	...	...
160,000	10	Apl. 4	6	6	San Paulo 6 p.c. Pref. ...	7—7½	...	...
1,736,968	Stk.	Apl. 4	6	6	Sheffield Cons.	108—112e	...	...
95,000	,,	July 18	4	4	Do. 4 p.c. Deb.	90—94c	...	...
133,201	,,	Feb. 29	8½	5	Shrewsbury 5 p.c. Ord. ...	110—115	...	...
90,000	10	June 6	15	15	South African	4—6	...	...
6,709,895	Stk.	Aug. 8	7	5	South Met. Ord.	112—117	−1½	113—115¾
1,195,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	130—135	...	131—132
1,895,445	,,	July 4	3	3	Do. 3 p.c. Deb. ...	75—80	...	76—77
1,000,000	,,	July 18	4	5	Do. 5 p.c. Red. Deb.	108—113	...	112
91,500	,,	Aug. 8	8½	8½	South Shields Con.	129—131d	...	...
1,543,795	,,	Aug. 8	6	6	South Suburban Ord. 5 p.c.	112—117	...	112
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	108—113	...	...
668,837	,,	June 20	5	5	Do. 5 p.c. Deb.	116—121	...	118—119½
647,740	,,	Aug. 22	5	5	Southampt'n Ord. 5 p.c. max.	93—98*	...	...
121,275	,,	June 20	4	4	Do. 4 p.c. Deb.	88—93	...	...
200,000	,,	June 20	6½	6½	Swansea 6½ p.c. Red. Deb.	105—110	...	...
1,076,490	,,	Aug. 8	6⅝	6⅝	Tottenham and District Ord.	127—132	...	128 129½
300,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	114—119	...	...
199,005	,,	June 20	4	4	Do. 4 p.c. Deb. ...	91—96	...	...
85,701	,,	Apl. 4	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	70—75	...	70
					Uxbridge, Maidenhead, &			
346,069	,,	Aug. 22	7	7	Wycombe 5 p.c.	128—133*	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	100—105*	...	...
1,322,220	,,	July 4	7	7	Wandsworth Consolidated	135—140	...	136½—137
971,373	,,	,,	5	5	Do. 5 p.c. Pref.	108—113	−1	...
1,167,964	,,	June 20	5	5	Do. 5 p.c. Deb.	115—120	...	118
158,400	,,	Aug. 22	6g	5	Winchester W. & G. 5 p.c. Con.	98—103†	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

STOCK FOR SALE BY AUCTION.

TO INVESTORS, CAPITALISTS, AND SPECULATORS.

SALE OF

£10,000 GOSPORT GAS STOCK

On Wednesday, 14th September, at 6.30 p.m.

AT GOSPORT ESTATE SALE ROOMS, "STAR CHAMBERS," 35 & 36, HIGH STREET.

By Order of the Board of Directors.

Under the Gosport Gas Acts and Orders, 1865–1931.

LLEWELLYN PUTTOCK & BLAKE

are favoured with instructions to SELL BY PUBLIC AUCTION as above,

£10,000

FIVE PER CENT. DEBENTURE STOCK

(Redeemable at par, 1943),

in the

GOSPORT DISTRICT GAS COMPANY,

in Lots of £20, £50, and £100.

Free of any Fees to Purchasers.

Printed Particulars will be forwarded free upon application to the CHIEF OFFICES of the COMPANY, HIGH STREET, GOSPORT, at the BRANCH OFFICES, LEE-ON-THE-SOLENT, FAREHAM, and BISHOP'S WALTHAM, or of the AUCTIONEERS, LLEWELLYN PUTTOCK & BLAKE, 123, HIGH STREET, GOSPORT.

(This announcement is inserted gratuitously.)

PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

THE CHAIRMAN,

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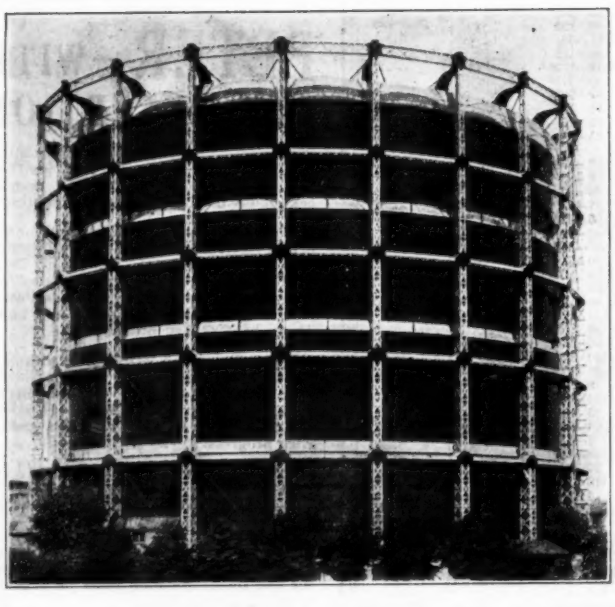

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